NiSource Corporate Services

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June 6, 2005

BY OVERNIGHT DELIVERY AND E-FILE

Mary L. Cottrell, Secretary
Department of Telecommunications and Energy
One South Station
Boston, MA 02110

Re: Bay State Gas Company, D.T.E. 05-27

Dear Ms. Cottrell:

Enclosed for filing, on behalf of Bay State Gas Company ("Bay State"), please find Bay State's responses to the following information requests of the Attorney General:

AG-1-80	AG-1-81	AG-1-82	AG-1-95		
AG-2-1	AG-2-7	AG-2-10	AG-2-11	AG-2-14	AG-2-17
AG-2-18	AG-2-19	AG-2-20	AG-2-21	AG-2-22	AG-2-23
AG-2-24	AG-2-25	AG-2-26	AG-2-27	AG-2-28	AG-2-29
AG-2-30	AG-2-31	AG-2-32	AG-2-33	AG-2-41	AG-2-42
AG-2-43	AG-2-44	AG-2-48	AG-2-49	AG-2-52	AG-2-53
AG-2-54	AG-2-55	AG-2-56	AG-2-57	AG-2-58	AG-2-59
AG-2-60	AG-2-62	AG-3-7	AG-3-8 (BULK)		AG-3-12
AG-3-13	AG-3-14	AG-3-15	AG-3-16	AG-3-17	AG-3-18
AG-3-19	AG-3-20				

Please do not hesitate to telephone me with any questions whatsoever.

Very truly yours,

Patricia M. French

cc: Caroline O'Brien Bulger, Esq., Hearing Officer (1 copy)
A. John Sullivan, DTE (7 copies)
Andreas Thanos, Ass't Director, Gas Division
Alexander Cochis, Assistant Attorney General (4 copies)
Service List

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

RESPONSE OF BAY STATE GAS COMPANY TO THE
FIRST SET OF INFORMATION REQUESTS FROM THE ATTORNEY GENERAL
D. T. E. 05-27

Date: June 6, 2005

Responsible: John E. Skirtich, Consultant (Revenue Requirements)

AG-1-80: Please provide in list form the details of all warranty claims the Company has pending including but not limited to the amount being sought, the manufacturer, the date the claim was submitted, the specific item(s) under warranty and a copy of all communications between the Company and/or its legal counsel and the manufacturer and/or the insurer.

Response: Bay State does not maintain this information in the format requested. Bay State is compiling the requested material and intends to supplement this response when its review is complete.

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

RESPONSE OF BAY STATE GAS COMPANY TO THE
FIRST SET OF INFORMATION REQUESTS FROM THE ATTORNEY GENERAL
D. T. E. 05-27

Date: June 6, 2005

Responsible: John E. Skirtich, Consultant (Revenue Requirements)

AG-1-81: Please provide in list form the details of all legal suits presently pending in which NiSource and/or the Company is a defendant including but not limited to the case name, the date of the filing of the case, the amount of relief sought, and the nature of the case.

Response: Bay State does not maintain this information in the format requested. Bay State is compiling the requested material and intends to supplement this response when its review is complete.

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

RESPONSE OF BAY STATE GAS COMPANY TO THE
FIRST SET OF INFORMATION REQUESTS FROM THE ATTORNEY GENERAL
D. T. E. 05-27

Date: June 6, 2005

Responsible: John E. Skirtich, Consultant (Revenue Requirements)

AG-1-82: Please provide in list form the details of all legal suits presently pending which NiSource and/or the Company have filed and/or which involve NiSource and/or the Company.

Response: Bay State does not maintain this information in the format requested. Bay State is compiling the requested material and intends to supplement this response when its review is complete.

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

RESPONSE OF BAY STATE GAS COMPANY TO THE
FIRST SET OF INFORMATION REQUESTS FROM THE ATTORNEY GENERAL
D. T. E. 05-27

Date: June 6, 2005

Responsible: John E. Skirtich, Consultant (Revenue Requirements)

AG-1-95: Please itemize and quantify the Company's outside legal fees for each of the last three years. Please provide copies of all invoices and bills supporting the costs for outside legal services. Please provide copies of all contracts or fee agreements for these services.

Response: Bay State does not maintain this information in the format requested or in a single business location. Bay State is compiling the requested material and intends to supplement this response when its review is complete.

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

RESPONSE OF BAY STATE GAS COMPANY TO THE
SECOND SET OF INFORMATION REQUESTS FROM THE ATTORNEY GENERAL
D. T. E. 05-27

Date: June 6, 2005

Responsible: Danny G. Cote, General Manager

AG-2-1 For each of the years from 1990 to 2005, please provide the following:

a) the rate of corrosion leaks per mile for bare steel for the Company;
b) the rate of corrosion leaks per mile for bare steel for the each of the Company's separate service areas;
c) the rate of corrosion leaks per mile for coated steel without cathodic protection for the Company;
d) the rate of corrosion leaks per mile for coated steel without cathodic protection each of the Company's separate service areas; and,
e) plot the corrosion leaks on system maps for each of the Company's separate service areas.
f) provide all work papers, calculations and assumptions for (a)-(d).

Response: Bay State's Department of Transportation (DOT) reported data and distribution system maps do not distinguish between corrosion leaks occurring on its (1) unprotected bare steel ("UBS"), (2) unprotected coated steel ("UCS"), (3) cathodically protected bare steel ("CPBS"), or (4) cathodically protected coated steel ("CPCS"). Although the Company has annually reported for years the miles of UBS, UCS and CPCS mains as well as the number of UBS, UCS and CPCS services on the DOT F7100.1-1 Annual Reports for Distribution Systems, the Company does not report miles of UBS, UCS and CPCS mains and number of services in its three incontiguous service territories on separate DOT F7100.1-1 reports. Rather, the data are captured in individual worksheets and reported in the aggregate.

Corrosion in the technical or operational sense does not occur on any other pipe type except steel. Other metals may deteriorate or graphitize, and otherwise weaken and need replacement, but deterioration in unprotected steel results from corrosion. Therefore, based on its operational judgment, the Company assumes for planning purposes that its corrosion leaks are associated with UBS and UCS-collectively referred to as unprotected steel ("US").

Regarding Bay State's response to items a) & b) above, please see column K (Cor Leaks per Mile of BS and Cor Leaks per 1000 BS Services) of Attachment AG-02-01 for the rate of corrosion leaks per mile of bare steel main and per 1000 bare steel services between 1990 and 2004. The corrosion leak rate in column K was derived strictly from figures from the DOT F7100.1-1 Annual Reports for Distribution System and worksheets. The rate was determined by dividing the number of leaks on mains due to corrosion by the total miles of UBS mains and by dividing the number of leaks on services due to corrosion by the total number of UBS services. Data for each division of Bay State and for the Company on a consolidated basis are separately provided.

Regarding Bay State's response to items c) & d) above, please see column L (Cor Leaks per Mile of UCS and Cor Leaks per 1000 UCS Services) of Attachment AG-02-01 for the rate of corrosion leaks per mile of unprotected coated steel main and per 1000 unprotected coated steel services. The corrosion leak rate in column L was derived strictly from figures from the DOT F7100.1-1 Annual Reports for Distribution System and worksheets. The rate was determined by dividing the number of leaks on mains due to corrosion by the total miles of UCS mains and by dividing the number of leaks on services due to corrosion by the total number of UCS services. Data for each division of Bay State and for the Company on a consolidated basis are separately provided.

As noted above, the Company's Steel Infrastructure Replacement (SIR) program addresses all unprotected steel. Please see column M (Cor Leaks per Mile of US and Cor Leaks per 1000 US Services) of Attachment AG-02-01 for the rate of corrosion leaks per mile of unprotected steel main and per 1000 unprotected steel services between 1990 and 2004. The corrosion leak rate in column M was derived strictly from figures from the DOT F7100.1-1 Annual Reports for Distribution System and worksheets. The rate was determined by dividing the number of leaks on mains due to corrosion by the total miles of US mains and by dividing the number of leaks on services due to corrosion by the total number of US services. Data for each division of Bay State and for the Company on a consolidated basis are separately provided.

As one can see from column M, the leak rate per mile has increased considerably over the last ten years particularly in the Brockton division. It is this rate of increase that is the primary driver behind the Company's SIR program.

For Bay State's response to e), please note that over the years, the Company has maintained division-specific leak progression maps (i.e., chronological series of maps segmented into sections of each respective service territory), which show where both main and service corrosion leaks were repaired over time. The leak repair data used for plotting these maps comes from the Company's Work Order Management System ("WOMS").

As has been indicated previously to the Attorney General, these maps are available to read in hard copy format at the individual operations centers in Lawrence, Brockton and Springfield. This is because Bay State maintains only one original set of its approximately 236 separate leak progression maps pertaining to its Brockton Division; only one original set of its 30 separate leak progression maps that pertain to its Lawrence Division; and only one original set of its 106 separate leak progression maps that pertain to its Springfield Division. Each individual map denotes activity in various ways. For example, in the Lawrence division, leak progression maps include activity for three distinct time periods worth of leak repairs, while the Springfield division maps denote activity from 1985 to present. Each map is 24 inches by 36 inches in dimension, is color-coded to differentiate between service and main leak repairs, and may contain sensitive system and customer specific information. Accordingly, such maps are proprietary to the Company, integral to the operational integrity and safety of its business, can be duplicated only at significant expense, and the removal of such maps from operational centers and the transportation of such vital information to third parties is not recommended under corporate security rules.

The Company will work diligently with the Attorney General to ensure the AG's ability to review these maps in a timely and coordinated fashion at the Company's various operational centers.

Bay State Gas Company
Historical Mains and Services Data
Brockton Division

Mains

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Line No.	**Year**	**Unprotected Bare Steel**	**Unprotected Coated Steel**	**Cathodically Protected Bare Steel**	**Cathodically Protected Coated Steel**	**Plastic**	**Cast & Wrought Iron**	**NA**	**Total Miles of Main**	**All Leaks per all Miles of Main**	**Cor Leaks Per Mile of BS**	**Cor Leaks Per Mile of UCS**	**Cor Leaks Per Mile of US**	**Total Main Leaks**	**Cor**
1	1990	437	277	0	1066	221	292	NA	2293	0.18	0.54	0.85	0.33	415	236
2	1991	429	236	0	1107	259	289	NA	2320	0.22	0.82	1.49	0.53	503	352
3	1992	419	201	0	1145	301	287	NA	2353	0.18	0.64	1.34	0.44	426	270
4	1993	412	154	0	1193	341	283	NA	2383	0.25	0.98	2.62	0.71	598	404
5	1994	404	130	0	1220	385	281	NA	2420	0.40	1.39	4.32	1.05	974	561
6	1995	389	86	0	1267	424	279	NA	2445	0.26	1.16	5.26	0.95	638	452
7	1996	378	70	0	1287	462	273	NA	2470	0.26	1.16	6.24	0.98	649	437
8	1997	370	73	0	1288	500	271	NA	2502	0.24	1.06	5.38	0.89	596	393
9	1998	357	80	0	1285	540	265	NA	2527	0.28	1.31	5.83	1.07	718	466
10	1999	346	79	0	1290	572	261	NA	2548	0.27	1.38	6.03	1.12	688	476
11	2000	338	76	0	1293	604	259	NA	2570	0.35	1.88	8.36	1.53	899	635
12	2001	331	74	0	1294	636	256	NA	2591	0.29	1.76	7.85	1.43	757	581
13	2002	327	72	0	1294	653	254	NA	2600	0.24	1.40	6.38	1.15	622	459
14	2003	320	70	0	1296	674	254	NA	2614	0.33	1.88	8.59	1.54	874	601
15	2004	305	63	0	1306	722	256	NA	2652	0.30	1.67	8.08	1.38	804	509

Services

	Year	**Unprotected Bare Steel Svcs**	**Unprotected Coated Steel Svcs**	**Cathodically Protected B.S. Svcs**	**Cathodically Protected C.S. Svcs**	**Plastic Svcs**	**CI &WI Svcs**	**Cu Svcs**	**Total Number of Svcs**	**All Leaks per 1000 Svcs**	**Cor Leaks per 1000 BS Svcs**	**Cor Leaks per 1000 UCS Svcs**	**Cor Leaks per 1000 US Svcs**	**Total Svc Leaks**	**Cor svc**
16	1990	27072	8982	0	31882	27452	20	0	95408	3.34	4.99	15.03	3.74	319	135
17	1991	25936	8843	0	31780	30703	20	0	97282	5.35	9.41	27.59	7.02	520	244
18	1992	24859	8668	0	31612	34848	20	0	100007	5.24	7.32	21.00	5.43	524	182
19	1993	24544	8596	0	31566	38148	0	0	102854	7.31	11.45	32.69	8.48	752	281
20	1994	24053	8489	0	31441	41283	0	0	105266	8.30	11.56	32.75	8.54	874	278
21	1995	23542	8381	0	31305	44099	0	0	107327	8.47	7.90	22.19	5.83	909	186
22	1996	22963	8251	0	31128	48003	0	0	110345	6.81	9.06	25.21	6.66	751	208
23	1997	22332	8063	0	30810	51225	0	0	112430	6.96	8.24	22.82	6.05	782	184
24	1998	21677	7873	0	30531	55081	0	0	115162	7.74	14.62	40.26	10.73	891	317
25	1999	21103	7454	0	30321	57785	0	0	116663	7.25	11.80	33.40	8.72	846	249
26	2000	20566	7099	0	30181	60620	0	0	118466	6.26	11.43	33.10	8.49	742	235
27	2001	20208	6518	0	30181	62542	0	0	119449	7.48	10.74	33.29	8.12	894	217
28	2002	19564	6501	0	30181	64609	0	0	120855	5.50	7.67	23.07	5.75	665	150
29	2003	19099	6077	0	30181	66797	0	0	122154	7.63	12.93	40.65	9.81	932	247
30	2004	18631	5509	0	30181	68983	0	0	123304	5.99	9.45	31.95	7.29	739	176

Bay State Gas Company
Historical Mains and Services Data
Springfield Division

Mains

Line No.	A Year	B Unprotected Bare Steel	C Unprotected Coated Steel	D Cathodically Protected Bare Steel	E Cathodically Protected Coated Steel	F Plastic	G Cast & Wrought Iron	H NA	I Total Miles of Main	J All Leaks per all Miles of Main	K Cor Leaks Per Mile of BS	L Cor Leaks Per Mile of UCS	M Cor Leaks Per Mile of US	N Total Main Leaks	O Cor
1	1990	145	229	0	368	126	471	NA	1339	0.40	0.61	0.38	0.24	541	88
2	1991	142	229	0	368	151	465	NA	1355	0.24	0.41	0.25	0.16	330	58
3	1992	139	229	0	368	179	461	NA	1376	0.16	0.31	0.19	0.12	215	43
4	1993	137	228	0	369	202	453	NA	1389	0.25	0.42	0.25	0.16	343	58
5	1994	132	228	0	370	234	443	NA	1407	0.34	0.59	0.34	0.22	483	78
6	1995	129	228	0	369	250	440	NA	1416	0.35	0.74	0.42	0.27	489	95
7	1996	127	102	0	497	266	435	NA	1427	0.30	0.67	0.83	0.37	421	85
8	1997	123	83	0	515	285	428	NA	1434	0.24	0.40	0.59	0.24	337	49
9	1998	120	54	0	546	306	424	NA	1450	0.23	0.54	1.20	0.37	328	65
10	1999	120	53	0	546	325	422	NA	1466	0.32	0.82	1.85	0.57	468	98
11	2000	119	53	0	546	340	418	NA	1476	0.29	0.71	1.58	0.49	433	84
12	2001	118	53	0	546	353	416	NA	1486	0.26	0.43	0.96	0.30	380	51
13	2002	118	37	0	563	359	412	NA	1489	0.30	0.39	1.24	0.30	446	46
14	2003	114	36	0	565	368	410	NA	1493	0.28	0.68	2.14	0.51	424	77
15	2004	100	40	0	565	386	396	NA	1487	0.35	0.75	1.88	0.54	521	75

Services

Line No.	Year	Unprotected Bare Steel Svcs	Unprotected Coated Steel Svcs	Cathodically Protected B.S. Svcs	Cathodically Protected C.S. Svcs	Plastic Svcs	CI &WI Svcs	Cu Svcs	Total Number of Svcs	All Leaks per 1000 Svcs	Cor Leaks per 1000 BS Svcs	Cor Leaks per 1000 UCS Svcs	Cor Leaks per 1000 US Svcs	Total Svc Leaks	Cor svc
16	1990	44705	3014	0	14944	12122	0	0	74785	5.91	7.69	114.13	7.21	442	344
17	1991	43885	3014	0	14837	13490	0	0	75226	6.75	7.52	109.49	7.04	508	330
18	1992	43308	2941	0	14816	15404	0	0	76469	4.07	4.78	70.38	4.48	311	207
19	1993	42647	2826	0	14817	17486	0	0	77776	6.15	7.34	110.76	6.88	478	313
20	1994	39183	2756	0	17337	19546	0	0	78822	6.60	9.47	134.62	8.85	520	371
21	1995	38422	2651	0	17281	21486	0	0	79840	7.26	10.96	158.81	10.25	580	421
22	1996	37798	2448	0	17254	23372	0	0	80872	6.83	10.93	168.71	10.26	552	413
23	1997	36680	2238	0	17232	25024	0	0	81174	5.54	8.64	141.64	8.15	450	317
24	1998	35744	2138	0	17146	26679	0	0	81707	7.01	12.28	205.33	11.59	573	439
25	1999	35525	2088	0	17151	28425	0	0	83189	7.68	13.26	225.57	12.52	639	471
26	2000	35355	2059	0	17128	30187	0	0	84729	6.62	11.96	205.44	11.31	561	423
27	2001	35182	2009	0	17115	31550	0	0	85856	6.44	12.62	221.01	11.94	553	444
28	2002	34465	1936	0	17076	32958	0	0	86435	6.80	12.62	224.69	11.95	588	435
29	2003	33785	1871	0	17030	34148	0	0	86834	7.14	14.92	269.37	14.14	620	504
30	2004	33020	1632	0	17093	35532	0	0	87277	6.71	14.35	290.44	13.68	586	474

Bay State Gas Company
Historical Mains and Services Data
Lawrence Division

Mains

Line No.	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
	Year	**Unprotected Bare Steel**	**Unprotected Coated Steel**	**Cathodically Protected Bare Steel**	**Cathodically Protected Coated Steel**	**Plastic**	**Cast & Wrought Iron**	**NA**	**Total Miles of Main**	**All Leaks per all Miles of Main**	**Cor Leaks Per Mile of BS**	**Cor Leaks Per Mile of UCS**	**Cor Leaks Per Mile of US**	**Total Main Leaks**	**Cor**
1	1990	106	5	0	124	55	225	NA	515	0.48	0.38	8.00	0.36	248	40
2	1991	106	3	0	126	57	225	NA	517	0.40	0.28	10.00	0.28	206	30
3	1992	89	10	0	136	62	225	NA	522	0.37	0.24	2.10	0.21	193	21
4	1993	89	8	0	142	70	222	NA	531	0.35	0.22	2.50	0.21	186	20
5	1994	88	4	0	150	77	219	NA	538	0.59	0.61	13.50	0.59	317	54
6	1995	89	5	0	146	84	217	NA	541	0.54	0.37	6.60	0.35	292	33
7	1996	88	10	0	141	93	213	NA	545	0.37	0.55	4.80	0.49	199	48
8	1997	87	5	0	146	101	211	NA	550	0.40	0.49	8.60	0.47	219	43
9	1998	85	9	0	145	106	208	NA	553	0.69	0.94	8.89	0.85	383	80
10	1999	86	7	0	149	115	206	NA	563	0.62	0.90	11.00	0.83	350	77
11	2000	85	3	0	154	121	205	NA	568	0.57	1.00	28.33	0.97	324	85
12	2001	84	3	0	154	124	204	NA	569	0.53	0.64	18.00	0.62	299	54
13	2002	82	3	0	154	130	203	NA	572	0.65	1.32	36.00	1.27	374	108
14	2003	72	3	0	163	135	203	NA	576	0.66	1.29	31.00	1.24	378	93
15	2004	72	3	0	163	147	194	NA	579	0.83	1.25	30.00	1.20	478	90

Services

Line No.	Year	Unprotected Bare Steel Svcs	Unprotected Coated Steel Svcs	Cathodically Protected B.S. Svcs	Cathodically Protected C.S. Svcs	Plastic Svcs	CI &WI Svcs	Cu Svcs	Total Number of Svcs	All Leaks per 1000 Svcs	Cor Leaks per 1000 BS Svcs	Cor Leaks per 1000 UCS Svcs	Cor Leaks per 1000 US Svcs	Total Svc Leaks	Cor svc
16	1990	13557	1192	0	6470	7267	0	639	29125	4.81	8.04	91.44	7.39	140	109
17	1991	13252	1011	0	6651	7789	0	639	29342	6.71	11.39	149.36	10.59	197	151
18	1992	13027	698	0	6964	8469	0	636	29794	4.87	4.30	80.23	4.08	145	56
19	1993	12833	697	0	6967	9108	0	635	30240	1.65	1.01	18.65	0.96	50	13
20	1994	12541	140	0	6548	9843	0	625	29697	6.80	9.65	864.29	9.54	202	121
21	1995	12111	113	0	6575	10588	0	622	30009	5.66	6.94	743.36	6.87	170	84
22	1996	11217	536	0	6460	11604	0	621	30438	4.01	8.74	182.84	8.34	122	98
23	1997	11096	513	0	6184	12070	0	616	30479	4.59	8.56	185.19	8.18	140	95
24	1998	10955	576	0	5942	12494	0	613	30580	7.49	14.97	284.72	14.22	229	164
25	1999	10658	538	0	5913	12916	0	609	30634	5.19	12.39	245.35	11.79	159	132
26	2000	10600	507	0	5637	13649	0	609	31002	5.68	11.98	250.49	11.43	176	127
27	2001	9902	501	0	5821	14115	0	602	30941	5.43	10.60	209.58	10.09	168	105
28	2002	9654	454	0	5769	14699	0	599	31175	5.32	10.67	226.87	10.19	166	103
29	2003	9251	454	0	5769	15864	0	599	31937	6.04	16.32	332.60	15.56	193	151
30	2004	8878	444	0	5699	16543	0	595	32159	7.53	22.19	443.69	21.13	242	197

Bay State Gas Company
Historical Mains and Services Data
Consolidated

Mains

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Line No.	**Year**	**Unprotected Bare Steel**	**Unprotected Coated Steel**	**Cathodically Protected Bare Steel**	**Cathodically Protected Coated Steel**	**Plastic**	**Cast & Wrought Iron**	**NA**	**Total Miles of Main**	**All Leaks per all Miles of Main**	**Cor Leaks Per Mile of BS**	**Cor Leaks Per Mile of UCS**	**Cor Leaks Per Mile of US**	**Total Main Leaks**	**Cor**
1	1990	688	511	0	1558	402	988	NA	4147	0.29	0.53	0.71	0.30	1204	364
2	1991	677	468	0	1600	467	979	NA	4191	0.25	0.65	0.94	0.38	1039	440
3	1992	648	440	0	1650	542	976	NA	4256	0.20	0.52	0.76	0.31	834	334
4	1993	638	390	0	1722	613	958	NA	4321	0.26	0.76	1.24	0.47	1127	482
5	1994	624	362	0	1738	696	943	NA	4363	0.40	1.11	1.91	0.70	1761	693
6	1995	607	319	0	1781	758	936	NA	4401	0.32	0.96	1.82	0.63	1419	580
7	1996	593	182	0	1925	821	921	NA	4442	0.29	0.96	3.13	0.74	1269	570
8	1997	580	161	0	1950	886	910	NA	4487	0.26	0.84	3.01	0.65	1152	485
9	1998	562	143	0	1976	952	897	NA	4530	0.32	1.09	4.27	0.87	1429	611
10	1999	551	139	0	1985	1012	889	NA	4576	0.33	1.18	4.68	0.94	1506	651
11	2000	543	133	0	1994	1063	882	NA	4615	0.36	1.48	6.05	1.19	1656	804
12	2001	534	131	0	1995	1110	874	NA	4644	0.31	1.28	5.24	1.03	1436	686
13	2002	527	112	0	2012	1140	869	NA	4660	0.31	1.16	5.47	0.96	1442	613
14	2003	506	109	0	2024	1177	867	NA	4683	0.36	1.52	7.07	1.25	1676	771
15	2004	477	106	0	2034	1255	846	NA	4718	0.38	1.41	6.36	1.16	1803	674

Services

	Year	**Unprotected Bare Steel Svcs**	**Unprotected Coated Steel Svcs**	**Cathodically Protected B.S. Svcs**	**Cathodically Protected C.S. Svcs**	**Plastic Svcs**	**CI &WI Svcs**	**Cu Svcs**	**Total Number of Svcs**	**All Leaks per 1000 Svcs**	**Cor Leaks per 1000 BS Svcs**	**Cor Leaks per 1000 UCS Svcs**	**Cor Leaks per 1000 US Svcs**	**Total Svc Leaks**	**Cor svc**
16	1990	85334	13188	0	53296	46841	20	639	199318	4.52	6.89	44.59	5.97	901	588
17	1991	83073	12868	0	53267	51982	20	639	201849	6.07	8.73	56.34	7.56	1225	725
18	1992	81194	12307	0	53392	58721	20	639	206273	4.75	5.48	36.16	4.76	980	445
19	1993	80024	12119	0	53350	64742	0	635	210870	6.07	7.59	50.09	6.59	1280	607
20	1994	75777	11385	0	55326	70672	0	625	213785	7.40	10.16	67.63	8.83	1581	770
21	1995	74075	11145	0	55161	76173	0	622	217176	7.64	9.33	62.00	8.11	1659	691
22	1996	71978	11235	0	54842	82979	0	621	221655	6.43	9.99	64.00	8.64	1425	719
23	1997	70108	10814	0	54226	88319	0	616	224083	6.12	8.50	55.11	7.37	1372	596
24	1998	68376	10587	0	53619	94254	0	613	227449	7.44	13.46	86.90	11.65	1693	920
25	1999	67286	10080	0	53385	99126	0	609	230486	7.13	12.66	84.52	11.01	1644	852
26	2000	66521	9665	0	52946	104456	0	609	234197	6.32	11.80	81.22	10.30	1479	785
27	2001	65292	9028	0	53117	108206	0	602	236245	6.84	11.73	84.85	10.31	1615	766
28	2002	63683	8891	0	53026	112266	0	599	238465	5.95	10.80	77.38	9.48	1419	688
29	2003	62135	8402	0	52987	116809	0	599	240932	7.24	14.52	107.36	12.79	1745	902
30	2004	60529	7585	0	52973	121058	0	595	242740	6.46	13.99	111.67	12.44	1567	847

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

RESPONSE OF BAY STATE GAS COMPANY TO THE
SECOND SET OF INFORMATION REQUESTS FROM THE ATTORNEY GENERAL
D. T. E. 05-27

Date: June 6, 2005

Responsible: Danny G. Cote, General Manager

AG-2-7 Describe the Company's corrosion monitoring program for all types of materials (cast iron, bare steel, coated steel with cathodic protection, coated steel without cathodic protection and plastic) used in Company's distribution system by service area and provide the year when the program went into effect, the date of any changes, and the details of the sampling program for each type of material.

Response: Bay State employs two key methods of managing and monitoring corrosion. The first is to cathodically protect its infrastructure where it is appropriate to do so, and to actively test cathodically protected mains to ensure that the current is maintained at a level sufficient to guard against corrosion. Bay State believes this method was undertaken as a practice effective in 1971. The second is to exceed federal standards for leak survey frequency, and to annually survey its facilities in order to determine and to take appropriate action relative to class, location, failures, leakage history, corrosion, changes in cathodic protection requirements, and other unusual operating and maintenance condition. In this way, Bay State tracks each and every system leak and compares that information to mileage of pipe by type. This approach is most successful in addressing potential system weakness and exposing system vulnerabilities where they exist. This method has been in use for the last 10 years.

With regard to the installation of cathodic protection, Bay State's program was inspired by the July 31, 1971 passage of the Pipeline Safety Act, which was codified by regulations at CMR 49 Part 192.465. This law required distribution companies (1) to cathodically protect all steel infrastructure if it could be reasonably accomplished, and (2) to only install new steel infrastructure if the distribution company was able to cathodically protect such infrastructure. As an operational matter, aside from brand new installations, the candidates for installation of cathodic protection in the existing steel infrastructure had to be coated mains in good condition.

The regulations required that each distribution then evaluate all bare steel for areas of active corrosion and repair or replace as the LDC determined appropriate. Each segment of the bare steel infrastructure is re-evaluated every three years if no cathodic protection is installed on it.

Where cathodic protection was installed on new mains and existing coated infrastructure, all (100%) of the mains must be retested every year to assure that the electrical current is sufficient. This test is done at every 100 feet and assures the correct current levels are impressed on the line. If the cathodic protection is insufficient, corrosion risk may recur; accordingly, Bay State remediates promptly by bringing the offending current back into compliance. In addition, each year 10% of Bay State's services are retested. This means 100% of Bay State's services are tested each ten years.

Bay State manages corrosion on its remaining non-cathodically protected steel infrastructure by active monitoring. As a general matter, infrastructure in areas of active corrosion is replaced. Bay State determines such areas by many methods, the most important of which is leak surveying. Bay State comprehensively undertakes an annual leakage survey of all transmission and distribution mains; an annual leakage survey of all services in business areas and services to public buildings, schools, churches, hospitals and nursing homes; an annual leak survey of public and commercial buildinns having a gas service pipe and having an active gas main on an adjacent street; a leakage survey every three (3) years of all other gas services connected to its system; and, a patrol-type leakage survey of all cast iron mains at least twice a year. Bay State also undertakes a visual inspection every time it uncovers its facilities for any reason, although such inspections occur most frequently at the installation of new or replacement mains and services; keyhole joint sealing operations; or at the time of leak repairs on mains. As part of this visual inspection, Bay State captures and records the results of that inspection in its work order management system ("WOMS").

Bay State's operational mains and services monitoring program for all types of materials is embodied in Chapter 7 of the Company's Operating & Maintenance Procedures (O&M) Manual. Most noteworthy in this regard is O&M Procedure 7.80. See, Attachment AG-2-7. As stated, every time a pipe is exposed for viewing for any reason, the field crew on location is tasked with observing the condition of the pipe and its coating, when such exists, and to document their findings. In addition, for steel, several other corrosion-monitoring and corrosion-control procedures are part of the Company's overall program. Field service crews in all three of Bay State's Massachusetts service territories use the same inspection and observation program.

Bay State's records indicate that while procedures to identify and document pipe risk were underway, a steel corrosion monitoring program was formally incorporated into the O&M manual in 1978. Attachment AG-02-07(a) provides a list of specific procedures which form the program, dates of previous, additions, deletions and revisions, and the effective date of the current procedure.

Bay State's leak management and system-wide distribution mains patrolling programs include: (1) mobile leak surveys, (2) public building surveys; (3) winter patrol surveys; (4) pre-paving leak surveys; and (5) blasting leak surveys. In addition, Bay State notes incident reports on WOMS. With regard to its Mobile Leak Survey. Bay State conducts a gas detection survey utilizing flame ionization equipment over its entire mains system. Any leak identified by the flame ionization unit is verified and classified with a combustible gas indicator test. Additional leak surveys are then simultaneously conducted, including performing gas indicator tests in surrounding, adjacent and connected natural gas, electric, telephone, sewer and water system manholes, at catch basins, at cracks in pavement and sidewalks, and in other locations known to collect migrating gas during a leak. Bay State repeats a flame ionization survey on an annual basis for the entire distribution system for in-business district and outside business district reviews.

For the Public Building Leak Survey, Bay State conducts public building leak surveys annually of defined public institutions, such as: schools, nursing homes, hospitals, orphanages, retirement residences, theaters, churches, arenas, downtown buildings, commercial buildings and municipal buildings. This survey entails taking combustible gas indicator tests at the point of entry of all gas, water, sewer and duct lines at the location and at cracks located on the street wall in the basement of the building. If evidence of gas is found entering the buildings during the survey, the situation is addressed and remediated immediately.

For the Winter Patrol Survey. Bay State undertakes winter patrols annually to identify hazards and damage that may occur as a result of local frost conditions. Not only does Bay State conduct its winter patrol surveys along every one of its mains located in a business district, Bay State surveys each and every cast iron main wherever it may be located, whether in business or in non-business districts. These surveys are conducted throughout the winter following evidence of reasonable frost penetration.

As part of the Prepaving Leak Survey, Bay State seeks out information regarding state and local intentions to undertake street reconstruction. When information is known to it, Bay State promptly evaluates all main segments under affected streets to determine if any of the segments are a candidate for replacement. Each potentially affected main segment is reviewed, including but not limited to the age of the pipe segment, the size, the leak history, and the number and type of services off the segment. Repair of the main -- or replacement of the main -- occurs before street reconstruction is completed.

<u>Blasting Leak Survey</u>. Due to its participation in Dig-Safe, Bay State is notified of planned third party excavations throughout the Commonwealth of Massachusetts and Bay State marks out its underground gas facilities when third party excavations are planned near its gas facilities. When blasting in particular is stated to be part of a planned excavation, Bay State's blasting leak surveys are conducted after blasting to verify the structural integrity of all nearby Bay State distribution system mains and services. In addition, when Bay State has cast iron pipe in the immediate area of third party construction, such as in a parallel trench, or in an area affected by a parallel construction, Bay State replaces the cast iron segment with plastic pipe at least 12 feet beyond the immediate area of excavation. This is also required by Bay State's O&M Procedures and Department regulations. In addition, Bay State routinely replaces cast iron with plastic pipe in areas of recent excavation or construction that are suspected of having been subject to unusual stresses, compaction caused by soil settlement, or other interference. Bay State's managers and engineers have extensive experience in evaluating the safety and reliability of each segment of Bay State's distribution system.

Sampling is conducted by obtaining a "coupon" of the pipe when it is exposed for repair. Currently, the Company has a coupon-sampling program for cast iron materials only. The Department's regulations at 220 CMR 113.00 require Bay State to capture and record the mechanical properties of its cast iron pipe. To meet this requirement, a cast iron coupon is taken from the pipe whenever (1) installing a new service, (2) performing a tie-in or retiring a cast iron main, and (3) performing a bag-off operation for any reason. Both the internal and external condition of the pipe is observed and documented. Graphitization has been observed on an extremely infrequent basis on Bay State's cast iron facilities. Most damage to cast iron occurs on joints or as a result of ground movement.

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

RESPONSE OF BAY STATE GAS COMPANY TO THE
SECOND SET OF INFORMATION REQUESTS FROM THE ATTORNEY GENERAL
D. T. E. 05-27

Date: June 6, 2005

Responsible: Danny G. Cote, General Manager

AG-2-10 Produce copies of all reports, memorandums and analysis related to mains and services corrosion monitoring in the Company's service territories prepared by outside experts or consultants.

Response: Bay State regularly monitors through corrosion surveys conducted by third-party independent contractors approximately 5,300 services and 2,037 miles of main on an annual basis. Bay State addresses multiple test locations on each of the approximately 4,000 segments represented.

Attachment AG-2-11(a) is a sample 2-sided service test card and a 2-sided mains test card that are used to conduct corrosion testing by in-field personnel. These tests are maintained at our field locations. The primary material generated by these test cards may be reviewed at Bay State's field locations. As it is bulk, numbering over 30,000 cards generated on an annual basis, the Company will work diligently with the Attorney General to ensure the AG's ability to review this information in a timely and coordinated fashion at the Company's various operational centers.

Please also refer Bay State's response to AG-2-16.

COMMONWEALTH OF MASSACHUSETTS
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RESPONSE OF BAY STATE GAS COMPANY TO THE
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D. T. E. 05-27

Date: June 6, 2005

Responsible: Danny G. Cote, General Manager

AG-2-11 Produce copies of all reports, memorandums and analysis related to mains and services corrosion monitoring in the Company's service territories prepared by Company employees.

Response: See Bay State's response to AG-2-10.

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

RESPONSE OF BAY STATE GAS COMPANY TO THE
SECOND SET OF INFORMATION REQUESTS FROM THE ATTORNEY GENERAL
D. T. E. 05-27

Date: June 6, 2005

Responsible: Danny G. Cote, General Manager

AG-2-14 Produce all Company training materials, employee handbooks and engineering guidelines that reference the Company's mains and services replacement program for the years 1995 to 2005.

Response: Bay State's primary field operations training is training of field operations leaders and employees relative to the expectations, standards, policies and guidelines contained in Bay State's Operating & Maintenance Procedures (O&M) Manual. Since the guide for all operations activity is embodied in the O&M manual, Bay State's training program focuses on the periodic review of discrete segments of the manual, and for replacement, would also reference leak surveying, emergency response, pipe condition, and records maintenance, among others. As described in Bay State's response to AG-2-8, Bay State's primary training materials are its Operating & Maintenance Procedures (O&M) Manual and its Massachusetts Cast Iron Main Replacement and Abandonment Reference Guide and Training Manual.

While the Company's O&M Manual, provided in response to AG-2-8 articulates many standards for replacement, please refer in particular to O&M procedure 14.15, Repair of Gas Leak on Distribution Main (attached hereto as Attachment AG-02-14(a)). Item 9 of the procedure discusses the prioritization of deteriorated or mechanically damaged steel main as candidates for replacement. This procedure was created in 1982. The procedure was subsequently revised in 3/13/95, 5/17/97, 7/15/98,7/28/00 and 12/31/02. The current version is provided.

Attachment AG-02-14(b) provides a pdf version of the Massachusetts Cast Iron Main Replacement and Abandonment Reference Guide and Training Manual. This manual has been in use since 1992. The guide includes O&M procedure 4.20A and 4.20B that form the basis for the Company's cast iron replacement and abandonment program. The training guide and procedures are consistent with the requirements of 220 CMR 113.

REPAIR OF GAS LEAK ON DISTRIBUTION MAIN

When the location of a leak has been determined, prepare the leak site as follows:

1. Check all houses.

2. Place a fire extinguisher near the work area where it will be accessible for immediate use.

3. Expose the main at the area of the leak. Be sure to note the condition of the exposed pipe according to Procedure 7.80.

4. Repair the leak.

5. Soap test the repair.

6. Check the adequacy of leak repairs before backfilling. Check the perimeter of the leak with a combustible gas indicator. In New Hampshire, where there is residual gas in the ground after the repair of a grade 1 leak, a follow-up inspection should be made as soon as practical after allowing the soil to vent and stabilize but in no case later than (1) one month following the repair.

7. Check all curb boxes of services coming from the main in the area of the leak.

8. If gas is present in the area probed in steps 6 and 7, additional leakage is present and shall be repaired.

9. If the main segment is made of steel and shows signs of deterioration or mechanical damage, notify the Field Operations Leader . If appropriate, he will notify Local Engineering to designate the segment as a candidate for replacement and prioritize the replacement according to a point system in their bare steel replacement database. If the main segment is made of steel and is in very poor condition, ask the Field Operations Leader for authorization to replace the segment. Note the overall condition of the exposed pipe, any coating damage, any graphitization, the pit depth on steel pipe and describe the type of corrosion damage (e.g. uniform, general, or localized corrosion).

10. Repairs to metallic mains and services must consider the following: Piping material, ie. Bare steel, cast iron, or coated steel; Repair method ie. stainless steel band clamp, "pumpkin" encapsulation device, or steel pin weldment, Residual gas in the trench atmosphere; Remaining wall (repaired) structural condition. Based on the above considerations employ the following guidelines: (a) On old bare steel mains, clean and coat the pipe with tape or mastic in accordance with the manufacturer's

recommended procedure.

(b) On coated steel pipe that is cathodically protected with anodes, repair any coating damage and install a Type "A" test station and 17 lb. anode for "hot spot" protection. Then, run the anode lead up into the test box. Do not thermit weld the anode directly to the pipe. Connect the anode lead to a pipe lead with a Burndy connector. (c) On rectifier protected lines, do not install any anodes directly to the pipe. Install a Type "A" test station (O&M 7.40) and if the corrosion technician specifically requests - drop an anode in the trench and run the anode lead up into the test box.

11. If the main is made of cast iron, each bell and spigot cast iron pipe operating at less than 25 psig that is exposed for any reason must be sealed by encapsulation. If general graphitization is found on a segment of cast iron pipe to a degree where a fracture or any leakage might result, the segment must be replaced. If localized graphitization is found on a segment of cast iron pipe to a degree where any leakage might result, the segment must be replaced, repaired or sealed by internal sealing methods adequate to prevent or arrest any leakage.

12. Record locations of repair fittings on the work order.

13. Backfill the excavation, restore the surface and fill bar holes with approved tar plugs before leaving the work area.

Reference 49 CFR 192.489, 192.753

BAY STATE GAS COMPANY

MASSACHUSETTS
CAST IRON MAIN REPLACEMENT & ABANDONMENT PROGRAM

REFERENCE GUIDE & TRAINING MANUAL

2004 EDITION

TABLE OF CONTENTS

Background & History

In April 1991, the Massachusetts Department of Public Utilities Pipeline and Safety Division promulgated a regulation mandating that gas utilities develop and implement a program and procedure to replace all cast iron pipe 8" or less in diameter adjacent to certain parallel excavations or crossed by certain trench crossings. The regulation specifies under what conditions of trench width, trench depth, soil type, etc. the pipe must be replaced. A copy of the regulation is in the Appendix for reference.

The reason for the implementation of the regulation is that cast iron pipe is known to be brittle and subject to failure when the ground support is disturbed or undermined. The Department's concern about the safe distribution of gas through cast iron pipe when affected by ground excavation led them to propose a formal structure to replace such pipe when induced stresses exceed the strength of the cast iron pipe.

The regulation addressing earth excavation is divided into two parts: parallel excavations and trench crossings.

Determination if Replacement is Required

The regulation is specific in defining under what circumstances the cast iron pipe must be replaced. Operations & Maintenance Procedures have been developed outlining these circumstances in accordance with the regulation. (See Appendix) Note that normal gas operations and maintenance activities such as repair of joint leaks and breaks, service installations or abandonments, main extensions or branch connections. and the like are exempt from this regulation.

If an excavation crosses our cast iron pipe, the depth and width of the trench and the depth of the cast iron pipe must be determined. Refer to the table on page 2 of Bay State Gas O&M Procedure 4.20 to determine if replacement is required. If the pipe must be replaced, the length is determined from the formula on page 3 of O&M Procedure 4.20. Alternately, for trench crossing less than 5 feet deep, a compaction option applies. The compaction option is described on page 3 of the O&M Procedure 4.20. All compaction must be done in accordance with O&M Procedure 4.05.

If an excavation parallels our cast iron pipe, the determination of replacement is a little more complex. Three cases where the cast iron must be replaced are described on pages 4 and 5 of Bay State Gas O&M Procedure 4.20. In some cases, the pipeline strain induced by the excavation must be calculated. Guidelines to determine pipeline strain are given in Procedure 4.20A. They are based on a study done by Prof. O'Rourke of Cornell University. A copy of this study is on file in the Divisional Engineering and Corporate Engineering Departments. If the cast iron needs to be replaced, the length to be replaced is determined as shown on page 6 of O&M Procedure 4.20.

If replacement is determined to be required either due to a parallel or a crossing excavation, the pipe must be replaced immediately, meaning the first regular workday that we can gain access to the pipe. Until that time, the pipe must be surveyed and monitored daily for gas leakage.

Administration

The program is administered through the DigSafe operation. DigSafe is a law in Massachusetts which requires persons intending to dig to notify utilities. Utilities then markout their facilities for the excavator. DigSafe is typically our first and most reliable communication of an excavator's intentions. Persons notifying us of excavation plans through other vehicles are informed of the DigSafe law. However, such notices of excavation are addressed as well.

* Flow of the process

The flow chart in the Appendix outlines the process followed when a DigSafe ticket is received. The first step is to question whether or not cast iron is in the area. If so, further investigation must take place. In some cases it can be determined from the information on the DigSafe ticket or from a phone call that the excavation is well outside the critical limits defined by the regulation and will therefore not affect our cast iron pipe. The flow chart follows the investigation through both parallel and crossing trenches to determine whether or not the cast iron will have to be replaced.

* Documentation & Record-keeping

The back of the blue copy of the DigSafe ticket is used to document the information and circumstances surrounding the excavation relative to our cast iron pipe. A copy of the DigSafe ticket is in the Appendix. When detailed calculations of pipeline strain are done, a copy of the calculation is attached to the blue copy of the DigSafe ticket.

Accurate and readily accessible records must be kept to verify compliance with the regulation. They must be maintained for at least five consecutive years after the calendar year to which the records apply.

* Annual Review of Procedures

Bay State Gas O&M Procedure 4.20 is reviewed and modified accordingly, at least once each calendar year, and more frequently if necessary.

Questions

Refer any questions to your Division Engineering Manager, Division Distribution Manager, or to Corporate Operations.

APPENDIX

MASSACHUSETTS REGULATIONS

220 CMR 113.00: OPERATION, MAINTENANCE, REPLACEMENT, AND ABANDONMENT OF CAST-IRON PIPELINES

Section

113.01: Applicability and Scope

(1) 220 CMR 113.00 regulates the operation, maintenance, replacement and abandonment of cast-iron pipelines that are used to distribute gas.

(2) 220 CMR 113.00 applies to every gas company, municipal gas department or other person engaged in the distribution of gas within the Commonwealth of Massachusetts.

113.02: Application for Exceptions from Provisions of 220 CMR 113.00

Any person engaged in the operation of a cast-iron pipeline may make a written request to the Department for an exception to the provisions of 220 CMR 113.00, in whole or in part.

The request shall justify why the exception should be granted and shall demonstrate why the exception sought does not derogate from the safety objectives of 220 CMR 113.00. The request shall include details on the need for the exception, specific information on the circumstances surrounding the requested exception, the provisions of the regulations from which exception is sought, and a description of any safety consequences that might result from the exception. Documentation in support of the request shall also be submitted.

The Department may deny the exception or grant the exception as requested, or as modified by the Department and subject to conditions. Any exception shall be issued in writing and may be made by the Director of the Division or by the Director's functional successor in the event of an internal reorganization of the Department. Any such person aggrieved by a decision of the Director regarding a request for an exception may appeal the Director's decision to the Commission. Any appeal shall be in writing and shall be made not later than ten business days following issuance of the written decision of the Director.

113.03: Definitions

Except as otherwise specified in 220 CMR 113.00, all words are defined as in 49 C.F.R. Part 192, Transportation of Natural And Other Gas By Pipeline: Minimum Federal Safety Standards.

Angle of Influence means a 45° angle above the horizontal starting from the bottom edge of the trench nearest to the main.

Deep Trench means an excavation that is more than five feet in depth.

Department means the Massachusetts Department of Public Utilities.

Determine means to make appropriate investigation using scientific or other definitive methods, reach a decision based on sound engineering judgment, and be able to demonstrate, substantiate, and document the basis of the decision.

Division means the Pipeline Engineering and Safety Division within the Massachusetts Department of Public Utilities.

High-pressure cast-iron pipe means a distribution line in which the gas pressure in the pipe is higher than the pressure provided to the customer.

Immediately means, except in the case of a gas-related emergency, the first regular workday that the operator can gain access to its facilities after the necessary State, City, or Town permits are expeditiously obtained and the statutory notification requirements have been met.

Low-pressure cast-iron pipe means a distribution line in which the gas pressure in the pipe is substantially the same as the pressure provided to the customer.

Person means any individual, firm, joint venture, partnership, corporation, association, state agency, municipality, municipal department, cooperative association, or joint stock association, and includes any trustee, receiver, assignee, or personal representative thereof.

Shallow trench means an excavation that is five feet or less in depth.

Sheeting means a bracing or shoring used to support the sides of an excavation to prevent its collapse during an excavation project.

Soft clay means earth that is easily molded by hand, or that has an unconfined compressive strength of 0.5 to 1.0 kips per square foot.

Strain means the physical deformation of a body caused by the application of an external force. It is usually expressed as a percentage.

113.04: General

(1) Cast-iron pipe shall not be installed for the distribution of gas after April 12, 1991.

(2) Any written program and procedures required by 220 CMR 113.00 shall be included in the operator's operating and maintenance plan required by 49 C.F.R. 192.603. This inclusion in the operating and maintenance plan shall be completed within 180 days of the effective date of 220 CMR 112.00.

(3) Any written program and procedures shall be reviewed and modified by the operator as necessary, provided that a review shall be conducted at least once each calendar year.

(4) Each operator shall maintain accurate and readily accessible records to administer and verify the implementation of these regulations. The records shall be maintained at a minimum for five consecutive years after the calendar year to which the records apply.

(5) Cast-iron pipe replacements required by 220 CMR 113.06 and 113.07 are not applicable to normal gas operations and maintenance activities such as repair of joint leaks and breaks, service installations or abandonments, main extensions or branch connections. The provisions of 220 CMR 113.05 pertaining to the development and implementation of a program and procedures regarding the replacement and adandonment of cast-iron pipelines shall apply to normal gas operations and maintenance activities.

113.05: Replacement and Abandonment Program and Procedures

(1) Each operator of buried cast-iron pipelines shall develop and implement, in accordance with this part, a written, comprehensive program and procedures regarding the replacement and abandonment of cast-iron pipelines. The program and procedures shall include, but not be limited to:

113.05: continued

(a) categorizing pipe by size and age;
(b) determining the methodology for selecting and prioritizing pipeline segments for replacement or abandonment; and
(c) replacing or abandoning within ten years of April 12, 1991, all cast-iron pipe with a nominal diameter of eight inches or less that is known, or has been determined, to have been installed before the year 1860.

(2) Each operator, to meet the requirements of 220 CMR 113.05(1)(b), shall consider, but not be limited by, the following criteria. In considering these criteria, each operator shall give reasonable regard to incorporating each criterion into the operator's program and procedures required by 220 CMR 113.05(1)(b). If any criterion is not included in the program and procedures, the operator shall make a detailed explanation of the consideration given the excluded criterion and the reason for the exclusion.
(a) mechanical properties of the pipe, including the extent that graphitic corrosion (graphitization) has occurred and affected those properties;
(b) chemical properties and corrosiveness of the soil in which the pipe is buried;
(c) external loads to which the pipe is subjected;
(d) operating pressure of the pipe;
(e) location and/or depth of the pipe;
(f) leak history of pipe segments;
(g) repair and maintenance history of pipe segments;
(h) the probability and consequences of pipe rupture and gas leakage;
(i) the existence of redundant gas mains in a street;
(j) repavement or reconstruction of streets in which pipelines are buried;
(k) capacity of a pipeline to meet gas supply requirements; and
(l) any known abnormal condition to which a pipe segment has been, or will be, subjected.

(3) Each operator shall establish a written time schedule for replacement or abandonment of cast-iron pipe. The schedule may be updated at any time during each year by the operator and shall include, as practicable, the size, length and location of pipe segments to be replaced or abandoned for each of the next three consecutive calendar years.

113.06: Replacement of Cast-Iron Pipe at Trench Crossings

(1) Cast-iron pipe, eight inches or less in nominal diameter, that is exposed and undermined by a trench crossing the pipeline shall be replaced immediately:
(a) When there is less than 24 inches of cover; or
(b) When there is 24 inches or more of cover and the trench widths set forth in Table 1 are exceeded.

Table 1
Maximum Allowable Trench Width

Depth of Cover:	2 to 4 feet	4 feet or more
Nominal Pipe Diameter		
4 inches or less	3 feet	4 feet
6 inches	4 feet	6 feet
8 inches	5.5 feet	8 feet

The trench width shall be determined by the distance along the centerline of the exposed pipe.

(2) The minimum length of the replacement shall be equal to the trench width plus twice the distance from the top of the pipe to the bottom of the crossing trench, extending equally on both sides of the crossing trench.

(3) When cast-iron pipe is intersected by a trench and the pipe must be replaced in accordance with 220 CMR 113.06, the pipe shall be surveyed daily for gas leakage and monitored daily until the pipe is replaced.

(4) At the operator's discretion, cast-iron pipe does not have to be replaced to comply with 220 CMR 113.06(1)(b) when a pipe segment is exposed and undermined in a shallow trench crossing, provided that:

(a) the backfill supporting and surrounding the pipe shall be thoroughly compacted for the full trench width and for a distance equal to ½ of the trench width on both sides of the centerline of the pipe;

(b) the backfill shall be free of objectionable material or debris, such as, but not limited to, pavement, frozen soil, trash and rocks; and

(c) The backfilling techniques used to comply with 220 CMR 113.06(4)(a) and (b) shall be included in the operator's operating and maintenance plan.

113.07: Replacement of Cast-Iron Pipe Adjacent to Parallel Excavations

(1) Cast-iron pipe, eight inches or less in nominal diameter, that is adjacent to parallel excavation shall be replaced immediately, provided that the excavation exceeds eight feet in length and a condition exists as set forth in 220 CMR 113.07(2), (3) or (4).

(2) A low-pressure cast-iron pipe that is parallel to a shallow trench excavation shall be replaced if:

(a) the pipe is exposed and undermined; or

(b) at least ½ of the pipe diameter lies within the angle of influence; and

1. the bottom of the excavation is below the water table; or
2. the excavation is in soft clay.

(3) A low-pressure cast-iron pipe that is parallel to a deep trench excavation and lies within the angle of influence shall be replaced if:

(a) the pipe is exposed and undermined; or

(b) the pipe is totally, or in part, within three feet of the edge of the trench and sheeting that may have been used is not left in place; or

(c) the operator determines that the strain on the pipe caused by, but not limited to, excessive ground movement or inadequate pipe support shall exceed 0.05% (500 microstrain).

(4) A high-pressure cast-iron pipe that is parallel to a shallow or deep trench excavation shall be replaced if:

(a) the pipe is exposed and undermined; or

(b) at least ½ of the pipe diameter lies within the angle of influence and sheeting that may have been used is not left in place.

(5) When cast-iron pipe is adjacent to a parallel excavation and must be replaced in accordance with 220 CMR 113.06, the pipe shall be surveyed daily for gas leakage and monitored daily until the pipe is replaced.

(6) Any pipe that replaces cast-iron pipe shall extend a safe distance, determined by the operator, beyond the point where parallel excavation terminates.

113.08: Training

(1) Each operator shall provide and implement a written plan of initial training to instruct all appropriate operating, maintenance, supervisory, and engineering personnel about:

(a) the requirements of 220 CMR 113.00;

(b) the programs and procedures that are developed to comply with 220 CMR 113.00;

(c) the methodology for selecting, prioritizing, and scheduling cast-iron pipe for replacement or abandonment; and

113.08: continued

(d) any operating and maintenance plans or procedures adopted to meet the requirements of 49 C.F.R. Part 192 pertaining to cast-iron pipe.

The initial training shall be completed within 210 days of the effective date of 220 CMR 113.00.

(2) A written plan of continuing instruction shall be developed and carried out at intervals of not more than two years to keep all appropriate personnel current on the knowledge and skills they have gained in the initial program and any modifications that have occurred as a result of the operator's annual review of any program and procedures.

REGULATORY AUTHORITY

220 CMR 113.00: M.G.L. c. 164.

NON-TEXT PAGE

OPERATING AND MAINTANCE PROCEDURES PERTAINING TO CAST IRON MAIN REPLACEMENT AND ABANDONMENT

REPLACEMENT OF CAST IRON MAINS

FOR MAINE AND NEW HAMPSHIRE ONLY

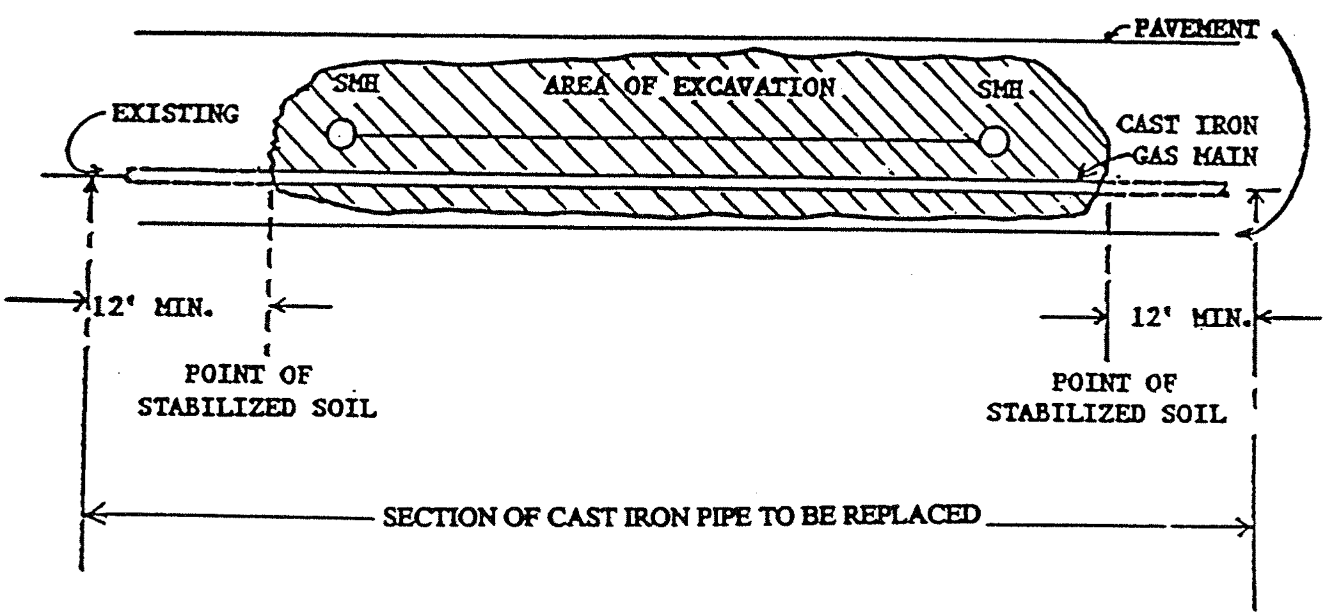
All cast iron pipelines in areas of recent excavation or construction that could be subject to unusual stress or bending caused by soil settlement or other natural or unnatural causes shall be replaced with plastic pipe.

Replace cast iron pipelines located in the immediate construction of a parallel trench or affected by a parallel trench according to the sketch below.

Use compression end couplings to connect cast iron to plastic. Install 3 pound magnesium anodes on the couplings. Clean and coat any fitting or portion of any fitting without a factory applied corrosion preventive coating.

Install a drip if necessary.

TYPICAL CAST IRON MAIN REPLACEMENT SKETCH FOR PARALLEL EXCAVATIONS



REPLACEMENT OF CAST IRON MAINS

FOR MASSACHUSETTS ONLY

Immediately replace any cast iron pipe 8" or less in diameter whenever a third party excavates nearby according to the two criteria given below:

I. Replacement of Cast Iron at Trench Crossings
II. Replacement of Cast Iron Adjacent to Parallel Excavations
III. Record Keeping
IV. Annual Review of Procedures

Immediately means the first regular workday that the operator can gain access to the pipe after obtaining necessary road opening permits. Until that time, if pipe must be replaced in accordance with state regulations, **survey and monitor the pipe daily** for gas leakage until it is replaced. **Daily** means each calendar day, including weekends, holidays, etc. (Reference: 220 CMR 113.06(3)

I. Replacement of Cast Iron Pipe at Trench Crossings

Replace all cast iron pipe 8" or less in diameter immediately when exposed **and** undermined:

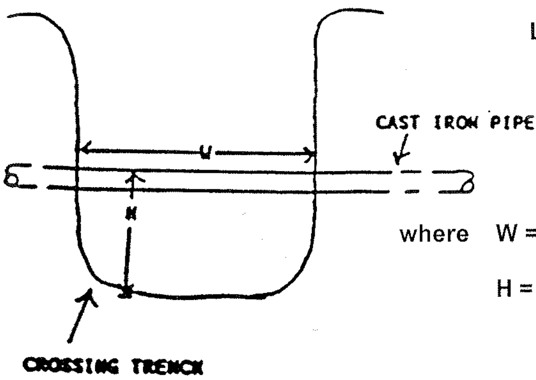
- o whenever there is less than 24" of cover; or
- o if there is 24" of cover or more, when the trench widths below are exceeded. Measure trench widths along the centerline of the exposed pipe:

MAXIMUM ALLOWABLE TRENCH WIDTH

Nominal Pipe Diameter	Depth of Cover on Cast Iron Pipe: 0 to 2 feet	2 to 4 feet	4 feet or more
4" or less	replace	3 feet	4 feet
6"	replace	4 feet	6 feet
8"	replace	5.5 feet	8 feet

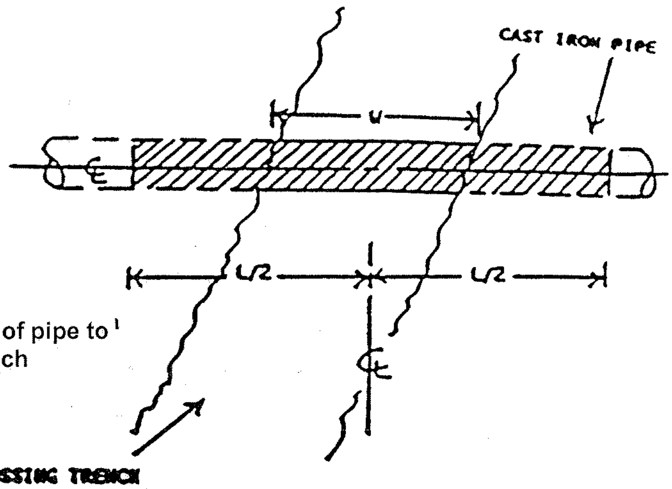
<u>Length of pipe to be replaced when crossed by 3rd party:</u>

Replace, at a minimum, a length equal to the trench width plus twice the distance from the top of the pipe to the bottom of the crossing trench. Measure the replacement distance equally on both sides of the trench:



L = W + 2H
= length to be replaced

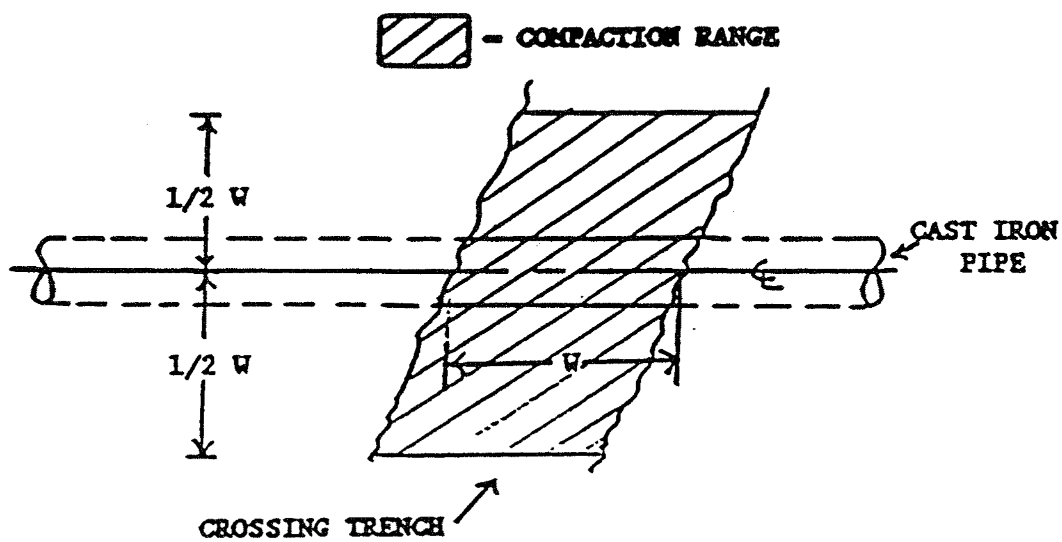
where W = width of trench
H = distance from top of pipe to bottom of the trench



<u>Options when crossed by a third party:</u>

The cast iron pipe does not have to be replaced if, at the discretion of the district supervisor all of the following are met:

1. the crossing trench is 5' or less in depth; <u>**and**</u>
2. the backfill supporting and surrounding the cast iron pipe is compacted in accordance with Bay State Gas O&M Procedure 4.05 for the full trench width and for a distance equal to one-half of the trench width on both sides of the centerline of the cast iron pipe (*see sketch below*); <u>**and**</u>
3. the backfill is clean and free of pavement, frozen soil, rocks, trash and other objectionable material or debris.



II. Replacement of Cast Iron Adjacent to Parallel Excavations

Replace all cast iron pipe 8" or less in diameter **immediately**, as defined below, when adjacent to a third party parallel excavation exceeding 8' in length in any of the three following situations. See "Length of Replacement" below to determine how much pipe must be replaced.

Immediately means the first regular workday that the operator can gain access to the pipe after obtaining necessary road opening permits. Until that time, if pipe must be replaced in accordance with state regulations, **survey and monitor the pipe daily** for gas leakage until it is replaced. **Daily** means each calendar day, including weekends, holidays, etc.

Definitions

Angle of Influence - the angle 45° above the horizontal starting from the bottom edge of the trench nearest to the cast iron main.

High Pressure Cast Iron Pipe - a cast iron distribution pipe in which the gas pressure is higher that the pressure provided to the customer, i.e., a "pounds" system.

Low Pressure Cast Iron Pipe - a cast iron distribution pipe in which the gas pressure is substantially the same as the pressure provided to the customer, i.e., an "inches" system.

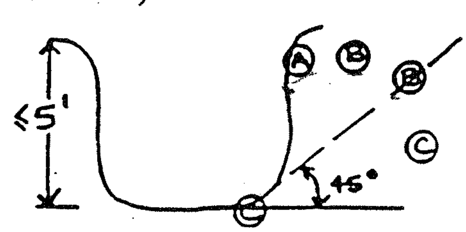
Soft Clay - earth that is easily molded by hand, or that has an unconfined compressive strength of 0.5 to 1.0 kips per square foot.

REPLACE CAST IRON PIPE IN THE FOLLOWING THREE SITUATIONS:

CASE 1

- o the cast iron pipe is low pressure, as defined above, **and**
- o the pipe is parallel to a third party trench 5' or less in depth, **and**

a) the pipe is exposed **and** undermined, or
b) at least one-half the pipe diameter lies within the angle of influence (defined above) and the bottom of the excavation is below the water table or the excavation is in soft clay (defined above).



- REPLACE A
- DO NOT REPLACE C
- REPLACE B IF EXCAVATION IS BELOW WATER TABLE OR IN SOFT CLAY

CASE 2

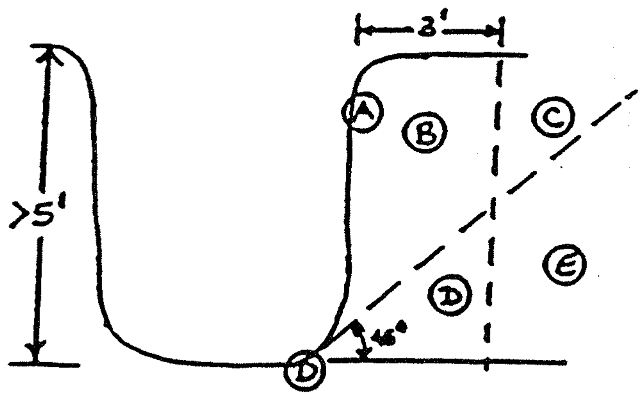
- the cast iron pipe is **low** pressure, as defined above, **and**
- the pipe is parallel to a third party trench greater than 5' in depth, lies within the angle of influence, **and** one or more of the following applies:

  a) the pipe is exposed **and** undermined.

  b) the pipe is totally or partially within 3' of the edge of the trench and sheeting is not left in place.

  c) the strain on the pipe caused by, but not limited to, excessive ground movement or inadequate pipe support exceeds 0.05% (500 microstrain). Determine strain according to BSG O&M Procedure 4.20 A.

  d) the pipe is 3" or less in diameter.



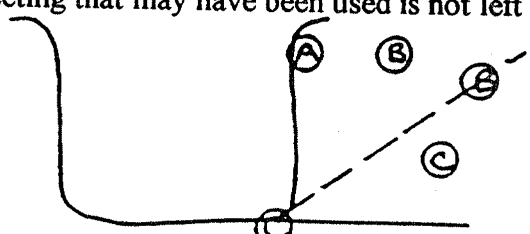
- REPLACE A
- DO NOT REPLACE D OR E
- REPLACE B IF SHORING IS NOT LEFT IN PLACE OR IF PIPE IS 3" OR LESS O.D.
- REPLACE B OR C IF STRAIN >= 500 MICROSTRAIN OR PIPE IS 3" OR LESS O.D.

CASE 3

- the cast iron pipe is **high** pressure, as defined above, **and**
- the pipe is parallel to **any** third party trench, **and**

  a) the pipe is exposed **and** undermined, or

  b) at least one-half of the pipe diameter lies within the angle of influence, as defined above, and sheeting that may have been used is not left in place.



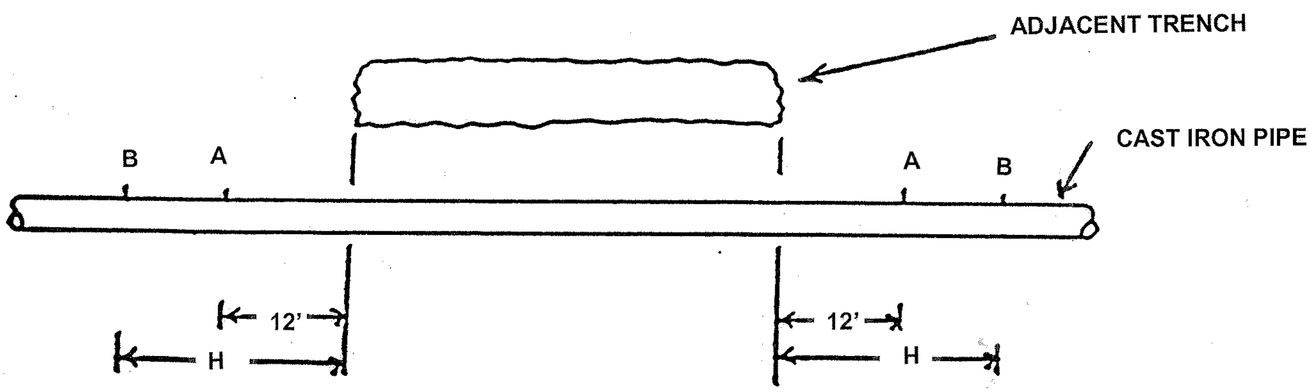
- REPLACE A
- DO NOT REPLACE C
- REPLACE B IF SHEETING IS NOT LEFT IN PLACE

Length of Replacement - Parallel Trenches

Replace the cast iron a minimum of 12 feet beyond the edge of the trench, measured horizontally, or a distance equal to the depth of the adjacent trench, whichever is greater.

H = Depth of Adjacent Trench

Replace A-A or B-B, whichever is greater



III. Record Keeping

Accurate, readily accessible records must be kept to verify compliance with this procedure for a minimum of five consecutive years after the calendar year to which the records apply.

IV. Annual Review of Procedures

Review this procedure, 4.20, and modify accordingly at least once each calendar year or more frequently if needed.

DETERMINING PIPELINE STRAIN FROM SOIL DISPLACEMENT [1]

Use these procedures in conjunction with Procedure 4.20, Part II, Section 2 or another approved method. The following method applies to 4", 6", and 8" diameter cast iron pipe only.

Determining pipe strain on cast iron pipe involves three steps:

1. Estimating maximum soil displacement based on soil conditions, excavation depth, and location.

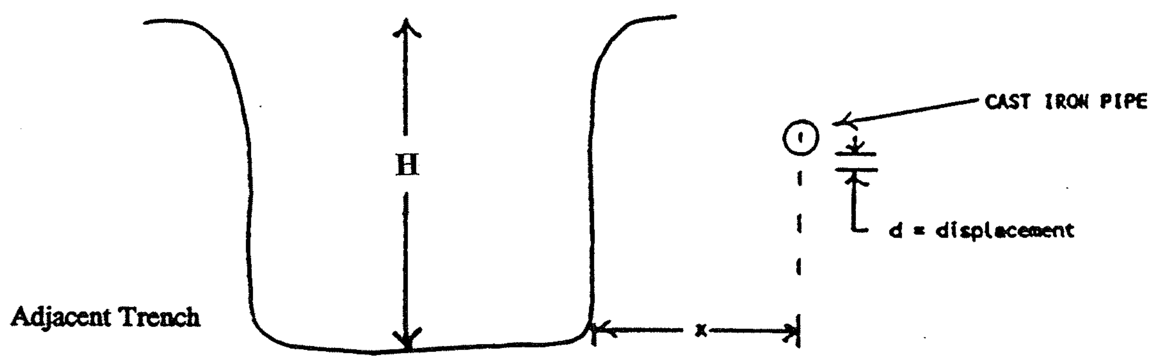
2. Determining maximum pipeline strain from soil displacement from Step 1.

3. Observing field conditions during construction to check assumptions.

Step 1 - Estimating Soil Displacement

Refer to Figure 1 to determine soil displacement. First determine:

1. the depth of the adjacent trench, H.
2. the horizontal distance from the edge of the excavation to the centerline of the parallel cast iron main, x.
3. the soil type, and classify as Zone A or Zone B - refer to "Soil Types" below to classify soil types.
4. the depth of the water table.



Once these items are determined, refer to Figure 1. Calculate the ratio x/H and read the value of d/H (this ratio is a percentage) along the proper soil zone curve. From d/H, determine the displacement, being sure to convert to inches. If there is or will be soil stockpiled on the side of the excavation or exceptionally heavy surcharges present, multiply the displacement by 1.5.

[1] Adopted from a study done in 1984 by Professor T.D. O'Rourke of Cornell University for the New York Gas Group entitled Manual for Assessing the Influence of Excavations on Parallel Cast Iron Gas Mains. A copy of the study is on file in the Corporate Operations Department in Westboro.

Surcharges - Six-wheel dump trucks, backhoes, and gradalls do not constitute exceptionally heavy surcharges. Soil placed at heights exceeding 4 feet, large cranes, and any construction vehicle exceeding 30,000 lbs in total dead weight does constitute an exceptionally heavy surcharge. If it is located within a distance equal to half the depth of the excavation of the sheeting line or edge of trench, multiply the displacement by 1.5 as described above.

Step 2 - Determining the Strain from Displacement

1. Refer to Figure 2. Locate the soil displacement on the x-axis. Read the bending strain along the y-axis corresponding to the proper diameter pipe. Note: this strain value represents both the vertical and horizontal bending strain.

2. To obtain the total bending strain, multiply the value from Figure 2 obtained in Step 1 above by the value 1.41.

3. If the total bending strain exceeds 500 microstrain, replace the pipe.

Step 3 - Observing Field Conditions During Construction

1. Steps 1 and 2 assume that the third party exercises good workmanship when working around cast iron facilities. If two or more of the following apply, re-evaluate the potential for excessive displacement of the cast iron pipe:

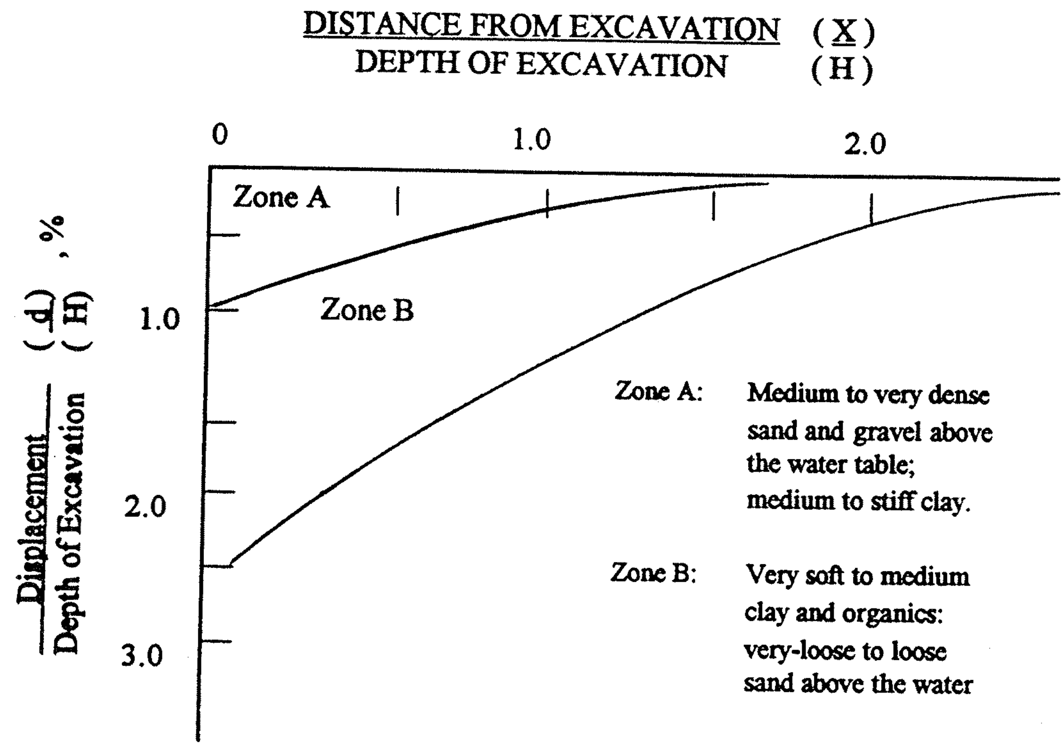
   - large gaps and spaces along sheeting line
   - voids behind the sheeting
   - lack of toe support for sheeting
   - obvious local distortion of sheeting, braces, or wales
   - haphazard backfilling or backfill not properly compacted
   - poor quality backfill (debris, rocks, timber, etc. or clay backfill which is not compacted carefully)

2. During third party construction, visit the site periodically to re-evaluate the conditions and assumptions on which the pipeline strain was determined. If the conditions or assumptions have changed, re-calculate the pipeline strain *if initial calculations showed the strain to be less than 500 microstrain.*

3. The ground water level can affect soil movement in the sidewalls of a trench. During excavation, if the trench is below the ground water level, the trench should be dewatered in a means to provide suitable control of ground movement. If the water table is above the trench bottom and the trench is not dewatered suitably, consider replacement of the cast iron pipe.

for examples, refer to the Cornell Study

FIGURE 1



Notes: 1. Zones based on field observations for average to good workmanship.

2. If soil will be stockpiled on side of excavation or an exceptionally heavy surcharge from construction equipment will be present, then multiply displacements of Zone A by 1.5.

3. Distance is from edge of the excavation to the centerline of a parallel main.

4. Water table may be lowered temporarily by dewatering with well points and deep wells outside the excavation, in which case the lower water table applies.

Chart for Estimating Soil Movements Adjacent to Deep Trench Construction.

FIGURE 2

Note: 1 microstrain = 1 x 10^{-6} or 0.0001 percent

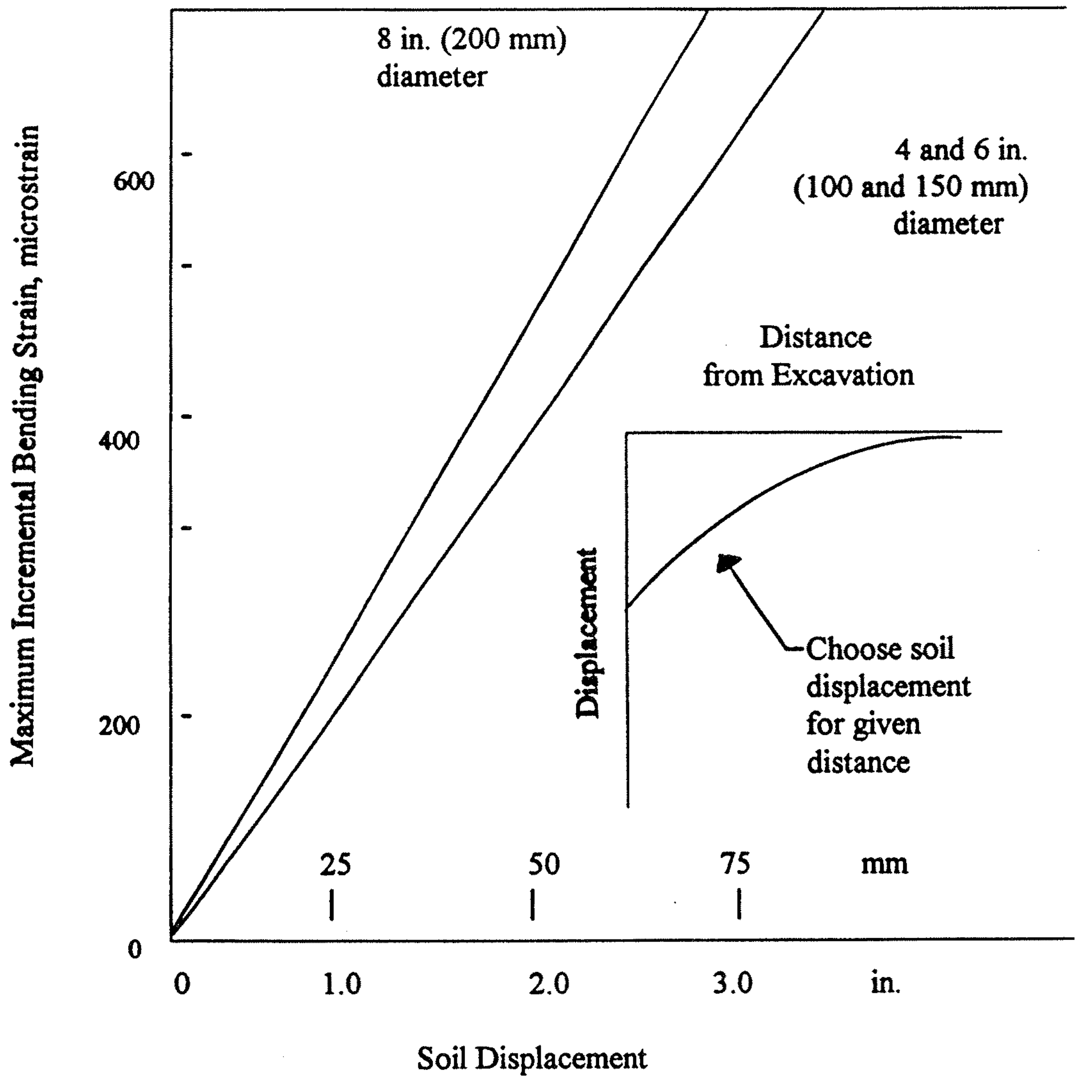


Chart for Determining Pipeline Strain from Soil Displacement.

CAST IRON REPLACEMENT AND ABANDONMENT PROGRAM

This procedure applies to the Massachusetts operating divisions only.

This procedure addresses 220 CMR 113: Operation, Maintenance, Replacement, and Abandonment of Cast Iron Pipelines, Section 113.05: Replacement and Abandonment Program and Procedures. Bay State Gas has developed and implemented this program to evaluate the cast iron pipe to prioritize and schedule failure-prone segments for replacement or abandonment.

The regulation also calls for replacement or abandonment by April 12, 2001 of all cast iron pipe with a nominal diameter of eight inches or less that is known, or has been determined, to have been installed before 1860. Bay State Gas, based on available information, does not believe to have any such pipe operating in its system.

THE PROGRAM

Certain segments of cast iron pipe are identified as *candidates* for replacement based upon certain "selection criteria". These segments are then entered in our data base of cast iron segments which includes characteristics of the pipe, its performance and maintenance history, risk factors, economic factors, etc. Based on these characteristics, point values are assigned. The point values are higher for those characteristics found to be more likely associated with a leak or break, for those characteristics associated with higher risk in the event of a leak or break, and for those characteristics associated with economic benefit to the company. Cast iron segments are ordered by descending total point value. The point value is then used to prioritize and schedule selected segments for replacement or abandonment for each of three years hence.

I. Selection Criteria

Each segment of cast iron pipe satisfying one or more of the following criteria is selected for further analysis:

1. Its maximum actual operating pressure is greater than 1/2 psig.

2. It lies underneath the roadway for which the municipality plans resurfacing or reconstruction and the pipe is 8" or less in diameter.

3. It is subject to replacement due to system improvements within a three year period.

4. Its performance history indicates either of the following:

   a. There is one or more pending leaks on the segment
   b. There have been three or more leak or break repairs made within the last four years (a rolling 12 months).

II. <u>Development of Data Base</u>

For each segment identified in Part I above, gather the following information:

- City
- Street name
  - from
  - to
- Year pipe was installed
- Diameter of pipe
- Pressure at which the pipe is operated (maximum actual operating pressure)
- Length of the segment
- Number of joint leaks
- Number of pipe breaks
- Number of other causes of pipe failure (i.e. drip, valve, etc.)
- Depth of the pipe
- Number of encapsulation kits or other effective joint sealing techniques applied to the segment (i.e., keyholes, Avon seals, etc.)
- Number of joint clamps or leak clamps installed (mechanical type only)
- Degree of external loads (heavy or light)
- Any abnormal conditions
- Soil corrosivity
- Number of pending leaks
- Any known chemical properties of the pipe
- Any known mechanical properties of the pipe
- Pressure at which the pipe is operated (maximum actual operating pressure)
- Location of the pipe relative to paving (paved to building line or not)
- Existence of public building(s), as defined by O&M Procedure 14.30, along the segment
- Whether or not road reconstruction or repavement is planned
- Whether or not system improvements to the segment are critical or beneficial to the distribution network
- Redundancy of mains (if and only if the segment can be retired without disabling the distribution network)

III. <u>Prioritization of Pipe Segments</u>

Prioritize the segments. Prioritization is done by Corporate Engineering on a data base file manager by a point system. Pipe segments for all three operating divisions in Massachusetts are combined at this time for prioritization. This allows for replacement or abandonment of the worst pipe segments, regardless of divisional boundaries.

IV. Evaluation of Results of Prioritization Model

Review the prioritized list of cast iron segments. This is done by Corporate Engineering and divisional Engineering. Where sound engineering judgment dictates, modifications to the list may be made. For each such modification, document the rationale. Additionally, assign point values to any abnormal conditions with a particular pipe segment. Currently, the Company does not have information on the mechanical properties of the cast iron pipe. However, the Company implemented a coupon sampling program in August 1992 as follows:

Coupon Sampling:
Take a coupon from the cast iron pipe whenever:

a. installing a new service tee
b. doing a tie-in or retiring a cast iron main
c. doing a bag-off for any other reason.

A separate data base will be developed and will include for each coupon the date taken, location, pipe diameter, pipe vintage year, pipe condition (external and internal), soil type and pH (determined from USDA maps), the wall thickness, and any other information thought to be relevant to the mechanical properties of the pipe segment as noted in the field. This data base will be analyzed independently of the overall prioritization model. The analysis will focus on relationships between the wall thickness and pipe condition with pipe diameter, vintage year, soil type, and soil pH. If such a relationship(s) is found, it will then be applied uniformly to the prioritization data base based on the segments pertinent characteristics.

V. Development of Three Year Schedule

Develop a three year schedule for the replacement/abandonment of specific cast iron pipe segments. This is done by Corporate and divisional Engineering.

1. Based on the resultant point values, schedule segments of cast iron for replacement.

2. Assess the impact of any abnormal conditions or mechanical or chemical properties of the pipe, as described in Part IV above. Assign points accordingly and adjust the priority list.

3. Modify the schedule as permitted in Part IV above to allow for sound engineering judgment. Document the rationale for the change.

4. Add any segments to be replaced/abandoned due to system or municipal needs.

VI. Administration

1. Time Schedule for Replacement

Develop a new three year schedule each calendar year. It is recommended that the schedule be updated in conjunction with the budgeting process by repeating each of the above steps. It is also suggested that the three year schedule be updated again in the following spring to allow for leak and break history surfacing in the winter months to be evaluated prior to the construction season.

2. Annual Review of Procedures

Review this procedure, 4.20B, and modify accordingly at least once each calendar year or more frequently if needed.

3. Record Keeping

Maintain accurate and readily accessible records to verify compliance with this procedure. Such records are to be kept for at least five consecutive years after the calendar year to which they apply.

VII. Training

Initial training with engineering personnel was effectively conducted on an individual basis when this program was developed. A written plan on initial training was developed in conjunction with the development of the program itself, and is to serve as the written plan for continuing instruction. Every two years, conduct the continuing instruction training session to update appropriate personnel on the Cast Iron Replacement and Abandonment Program.

TRENCH PADDING AND BACKFILLING PROCEDURE FOR MAINS

General

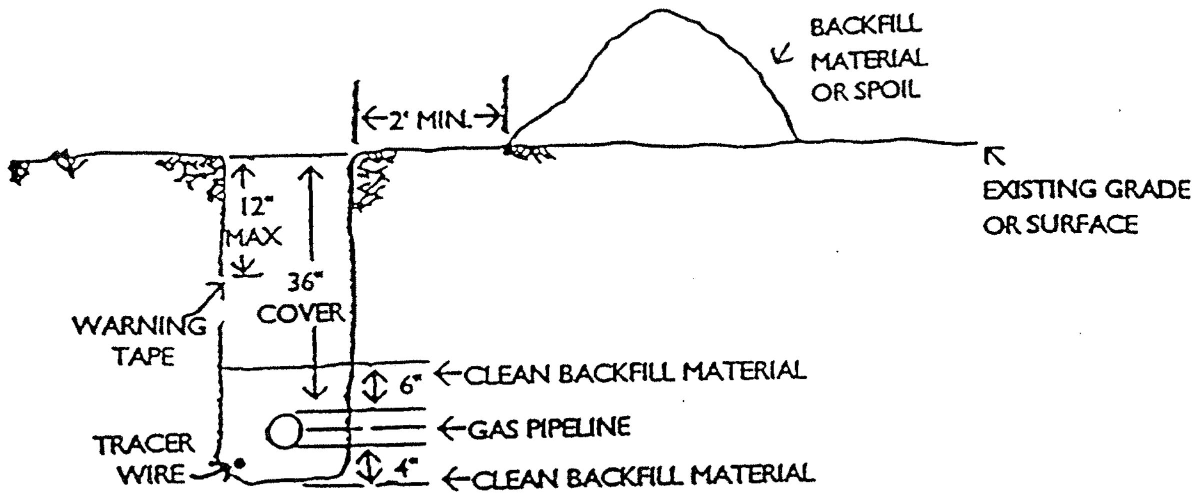
Install mains with a minimum of 36" of cover. Exceptions may be made within state and federal codes with the prior approval of the division Operations Manager. Install plastic pipe with slack so external loading or thermal contraction will not place unnecessary stress on the pipe or joints. In cases where a stopper fitting or other new material is added to an older main such that the main has less than 24" of cover (or 36" of cover in a Massachusetts state road), the Company or contractor should provide permanent protection such as concrete. Whenever a main will be installed with less than 24" of cover, notify the Operations Manager or his/her designee so that they can request approval from the Department of Public Utilities.

Procedure - *See Figure 1*

- Remove all excess water from the trench with pumps or equivalent.
- Place a layer of sand 4" deep in trench bottom before laying the pipe in the trench. The Operations Manager or Company field representative may allow use of clean fill material* instead of sand provided it is clean and free of any objects that may impinge on the pipe.
- For plastic pipe, install number 12 AWG solid copper wire (tracer wire) with yellow insulating jacket along the length of the main. Keep the tracer wire at least 4" away from the plastic pipe. This wire is used to locate the pipe. If the installation is trenchless, tracer wire may be less than 4" away from the plastic pipe.
- Place a minimum of 6" of sand over the pipe. The Operations Manager or Company field representative may allow use of clean fill material* instead of sand, provided it is clean and free of any objects that may impinge on the pipe.
- Place warning tape in the trench not more than 1' below finished grade. The standard warning tape is yellow, non-detectable tape, 6" wide. No warning tape is required if pipe installation is trenchless.
- Fill the rest of the trench with clean fill material, using the spoil where suitable and acceptable. If the original spoil material is not suitable for use as a sub-grade material when restoring road surfaces, use material required by state or local agencies. Remove all excess spoil in the accepted manner.
- Properly compact the trench to insure the trench will not settle. (See O&M Procedure 10.03 for a description of suitable materials for pipe bedding and final backfill.).

TRENCH PADDING AND BACKFILLING PROCEDURE FOR MAINS

FIGURE 1



For Cast Iron Pipe Crossed by Third Parties:

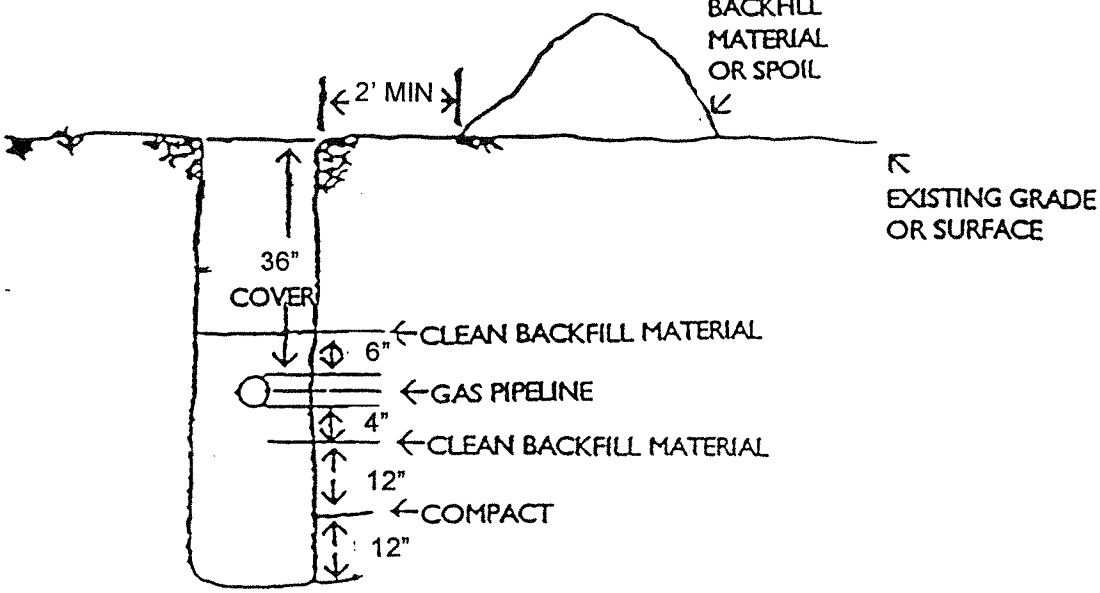
Use the following procedure in conjunction with BSG O&M Procedure 4.20 - Section I- Replacement of Cast Iron Pipe at Trench Crossings. Review and modify this procedure as necessary, but at least once each calendar year.

The Massachusetts regulation specifying replacement of cast iron pipe when crossed by third parties in some circumstances allows the option of compaction to replacement. *See BSG O&M Procedure 4.20 for details.* When opting for compaction, follow the procedure below to backfill supporting and surrounding the pipe. Backfill the remainder of the trench, if necessary, according to the general procedure above for backfilling trenches.

Place 12" of backfill in the trench. Compact mechanically in 12" lifts. Fill the remaining trench in subsequent 12" lifts, compacting each lift similarly, until 4" beneath the cast iron pipe. From 4" below the cast iron to 6" above the cast iron, place clean backfill material in the trench. Backfill the remainder of the trench in accordance with the general backfilling procedure, as described above. *See Figure 2 on page 3.*

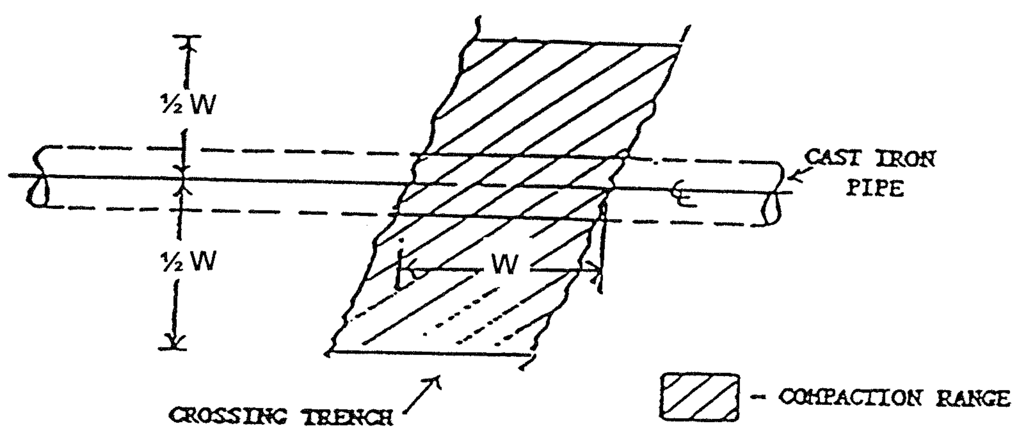
TRENCH PADDING AND BACKFILLING PROCEDURE FOR MAINS

FIGURE 2

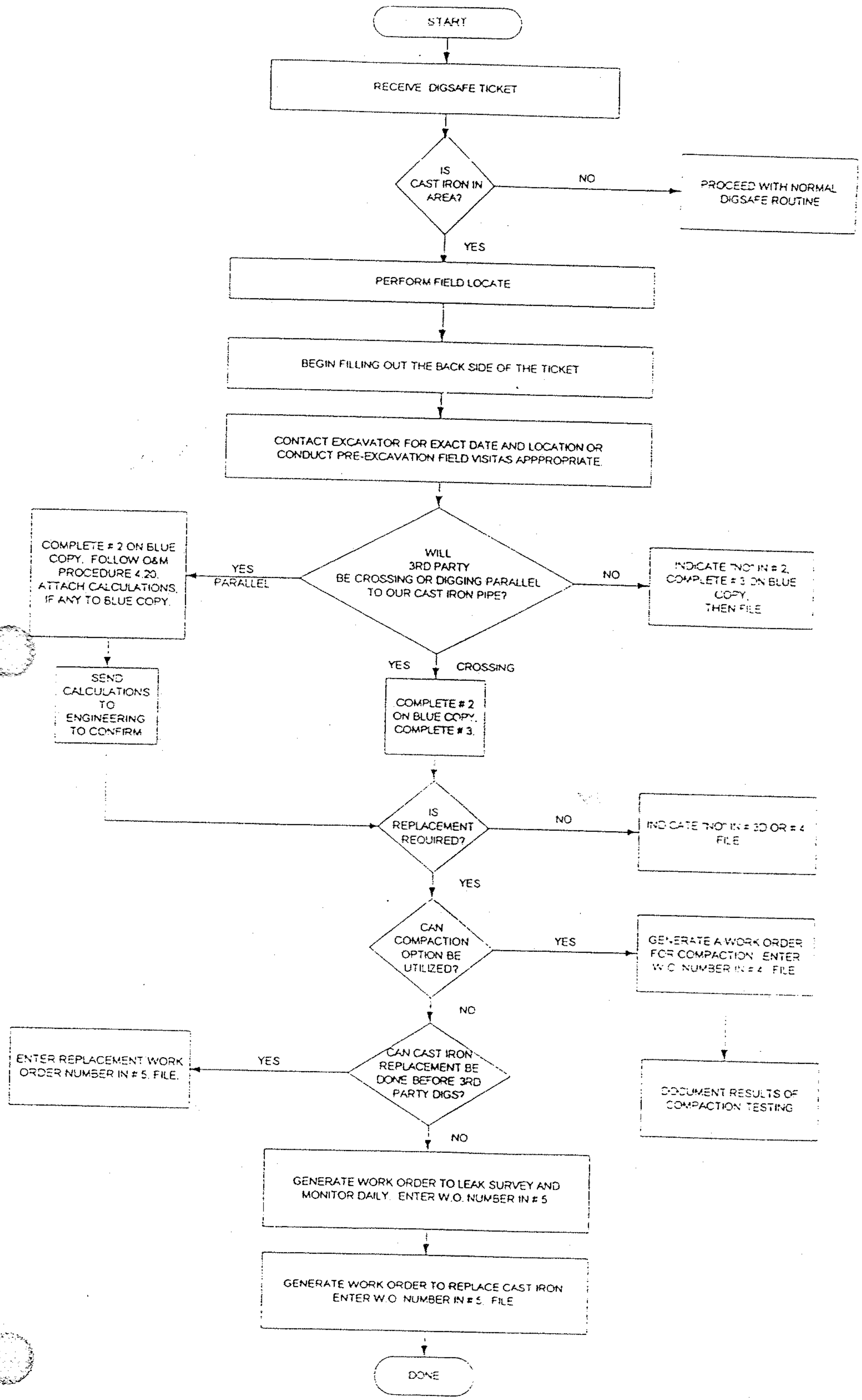


- Compact a distance equal to 1/2 of the trench width on both sides of the centerline of the cast iron pipe as described above. Measure trench width along the centerline of the exposed cast iron pipe. *See Figure 3.*

FIGURE 3



FLOW CHART


START
RECEIVE DIGSAFE TICKET
IS CAST IRON IN AREA?
NO
PROCEED WITH NORMAL DIGSAFE ROUTINE
YES
PERFORM FIELD LOCATE
BEGIN FILLING OUT THE BACK SIDE OF THE TICKET
CONTACT EXCAVATOR FOR EXACT DATE AND LOCATION OR CONDUCT PRE-EXCAVATION FIELD VISITAS APPPROPRIATE.
WILL 3RD PARTY BE CROSSING OR DIGGING PARALLEL TO OUR CAST IRON PIPE?
YES
PARALLEL
COMPLETE # 2 ON BLUE COPY. FOLLOW O&M PROCEDURE 4.20. ATTACH CALCULATIONS, IF ANY TO BLUE COPY.
SEND CALCULATIONS TO ENGINEERING TO CONFIRM
NO
INDICATE "NOT" IN # 2, COMPLETE # 3 ON BLUE COPY, THEN FILE
YES
CROSSING
COMPLETE # 2 ON BLUE COPY. COMPLETE # 3.
IS REPLACEMENT REQUIRED?
NO
INDICATE "NOT" IN # 3D OR # 4 FILE
YES
CAN COMPACTION OPTION BE UTILIZED?
YES
GENERATE A WORK ORDER FOR COMPACTION. ENTER W.O. NUMBER IN # 4. FILE
DOCUMENT RESULTS OF COMPACTION TESTING
NO
CAN CAST IRON REPLACEMENT BE DONE BEFORE 3RD PARTY DIGS?
YES
ENTER REPLACEMENT WORK ORDER NUMBER IN # 5. FILE.
NO
GENERATE WORK ORDER TO LEAK SURVEY AND MONITOR DAILY. ENTER W.O. NUMBER IN # 5
GENERATE WORK ORDER TO REPLACE CAST IRON ENTER W.O. NUMBER IN # 5. FILE
DONE

DIGSAFE TICKET

1. SIZE OF PIPE____________

2. IS DIGGING NEAR CI PIPE? ______Y ______N

   IF YES, IS DIGGING: ______ PARALLEL TO CI
   ______ CROSSING CI

3. **CROSSING TRENCHES:**

   a) DEPTH OF CI PIPE: ____________
   b) WIDTH OF CROSSING TRENCH: ____________
   Is crossing perpendicular to CI? ______Y ______N
   c) DEPTH OF CROSSING TRENCH: ____________
   d) IS REPLACEMENT REQUIRED? ______Y ______N

4. **PARALLEL TRENCHES:**

   IS REPLACEMENT REQUIRED? ______Y ______N
   Attach engineering calculations

5. **WORK ORDER NUMBERS:**

   LEAK SURVEY & MONITOR (DAILY): ____________
   ("N/A" if replaced before 3rd party digs)

   REPLACEMENT:____________

   COMPACTION:____________

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

RESPONSE OF BAY STATE GAS COMPANY TO THE
SECOND SET OF INFORMATION REQUESTS FROM THE ATTORNEY GENERAL
D. T. E. 05-27

Date: June 6, 2005

Responsible: Danny G. Cote, General Manager

AG-2-17 Produce copies of all reports, memorandums and analysis related to the mains and services replacement program in the Company's service territories prepared by Company employees.

Response: Bay State Gas Company monitors, evaluates, and prioritizes in order to ensure timely and efficient replacement of mains and services that need replacing. See Bay State's responses to AG-2-7, AG-2-8, AG-2-12, AG-2-54. Reports related to replacement are contained in the mains write-ups located in the Company's operations centers in Springfield, Brockton and Lawrence. Please see Bay State's response to AG-2-1.

The Company will work diligently with the Attorney General to ensure the AG's ability to review these files in a timely and coordinated fashion at the Company's various operational centers.

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

RESPONSE OF BAY STATE GAS COMPANY TO THE
SECOND SET OF INFORMATION REQUESTS FROM THE ATTORNEY GENERAL
D. T. E. 05-27

Date: June 6, 2005

Responsible: Danny G. Cote, General Manager

AG-2-18 Produce copies of all reports, memorandums and analysis related to any external causes of corrosion of the mains and services (including, but not limited to, proximity to other pipes, materials or sources of electricity) that are the subject of the Company's proposed replacement program.

Response: Please see Bay State's response to AG-2-16.

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

RESPONSE OF BAY STATE GAS COMPANY TO THE
SECOND SET OF INFORMATION REQUESTS FROM THE ATTORNEY GENERAL
D. T. E. 05-27

Date: June 6, 2005

Responsible: Danny G. Cote, General Manager

AG-2-19 Describe the Company's efforts to monitor changes in corrosion rates related to changes in the external environment in close proximity to the pipe or service, including, but not limited to, the introduction of other pipes, new materials or sources of stray electricity.

Response: As a general matter, Bay State uses leakage surveys and leak rates to monitor corrosion rates. Bay State has not attempted to monitor corrosion rates related to changes in the external environment in close proximity to the pipe, because such formal analyses would divert man-hours and personnel and the data derived therefrom would not result in a conclusion that the company could act upon that would reduce the number of future leaks in its unprotected steel distribution pipe. Based on its business and engineering judgment, Bay State believes the overall trending analysis is a superior and more efficient tool to monitor leakage trends. It relies on already-captured data provided in existing reporting requirements and it provides a data stream reflecting elapsed time to flatten out single year anomalies.

Moreover, as the industry became aware of the impact of corrosion in unprotected steel, Bay State adopted first the use of coated steel, then cathodically protected coated steel, and finally, where appropriate, plastic pipe in its distribution system as a means of mitigating corrosion. Please note, as indicated in other responses, that Bay State conducts a visual inspection of every segment of unprotected steel that it excavates and systematically captures that data on each individual work order. In addition to the information captured in that inspection process, Bay State takes notice of any unusual conditions that are recorded in the "comments" section of the work order. This record may include the noted observation of significant corrosion, void or evidence of loose soil under the pipe, or other important conditions, such as another utility in close subterranean proximity, another utility in contact with our underground facilities, the existence of large boulders or ledge, water, and the like.

The results of these observations are contained in Bay State's mains write-ups, work order and repair files. The Company will work diligently with the Attorney General to ensure the AG's ability to review this information in a timely and coordinated fashion at the Company's various operational centers.

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

RESPONSE OF BAY STATE GAS COMPANY TO THE
SECOND SET OF INFORMATION REQUESTS FROM THE ATTORNEY GENERAL
D. T. E. 05-27

Date: June 6, 2005

Responsible: Danny G. Cote, General Manager

AG-2-20 Produce copies of all reports, memorandums and analysis related to any internal causes of corrosion of the mains and services (including, but not limited to, moisture in the pipe) that are the subject of the Company's proposed replacement program.

Response: Bay State does not maintain any such information. This is because in the thousands of times Bay State has exposed its bare and coated steel mains and services (during leak repairs, main and service replacements, main and service abandonments, and other activities), it has not found any indication that internal corrosion is active in its system. Bay State does not dispute that internal corrosion can occur in large steel transmission pipelines if water is present. However, because of the basic construct of Bay State's distribution system, internal moisture is not an issue contributing to the corrosion of Bay State's unprotected steel infrastructure.

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

RESPONSE OF BAY STATE GAS COMPANY TO THE
SECOND SET OF INFORMATION REQUESTS FROM THE ATTORNEY GENERAL
D. T. E. 05-27

Date: June 6, 2005

Responsible: Danny G. Cote, General Manager

AG-2-21 Describe the Company's efforts to monitor changes in corrosion rates related to changes in the internal conditions of the pipe, including, but not limited to, moisture in the pipe.

Response: Based on Bay State's operational and management experience, including a review of records taken systematically by field personnel as pipes are unearthed, inspected and cataloged for replacement or repair, no visible corrosion has been determined to be a result of the internal condition of Bay State's unprotected steel pipes, including as such may be related to moisture inside of the pipe. As described elsewhere, Bay State maintains records of its visual inspection of each unprotected pipe segment each time it is unearthed.

As stated in Bay State's response to AG-2-26, and repeated here for convenience, moisture would only be able to get into Bay State's natural gas distribution system as a result of moisture present in the natural gas itself as it enters Bay State's distribution system from the interstate pipeline system. In order to combat moisture, interstate transmission pipelines monitor moisture levels in order to remain below the federally established maximum of seven (7) pounds per million cubic feet of natural gas delivered. The average moisture content as reported to Bay State by the transmission pipelines is approximately two (2) pounds per million cubic feet of natural gas delivered. Based upon Bay State's vast experience in managing and operating distribution systems, moisture content in the natural gas commodity is not a source of pipe deterioration in its system.

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

RESPONSE OF BAY STATE GAS COMPANY TO THE
SECOND SET OF INFORMATION REQUESTS FROM THE ATTORNEY GENERAL
D. T. E. 05-27

Date: June 6, 2005

Responsible: Danny G. Cote, General Manager

AG-2-22 By mains and service material type, describe a generally acceptable level of pipe moisture in the gas distribution industry for design engineering purposes.

Response: Please see Bay State's responses to AG-2-23, AG-2-24, AG-2-25, and AG-2-26.

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

RESPONSE OF BAY STATE GAS COMPANY TO THE
SECOND SET OF INFORMATION REQUESTS FROM THE ATTORNEY GENERAL
D. T. E. 05-27

Date: June 6, 2005

Responsible: Danny G. Cote, General Manager

AG-2-23 By mains and service material type, describe a generally acceptable level of pipe moisture in the gas distribution industry for operating purposes.

Response: Federal regulation and/or tariff provisions require interstate natural gas transmission companies to transport natural gas at moisture levels below seven (7) pounds per million cubic feet of natural gas delivered. On average, as stated in Bay State's response to AG-2-26, Bay State's operational experience shows that moisture levels are generally maintained at approximately two (2) pounds per million ;cubic feet of natural gas. This rate is consistent for all material types.

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

RESPONSE OF BAY STATE GAS COMPANY TO THE
SECOND SET OF INFORMATION REQUESTS FROM THE ATTORNEY GENERAL
D. T. E. 05-27

Date: June 6, 2005

Responsible: Danny G. Cote, General Manager

AG-2-24 For each of the system maps produced in response to AG-2-1(e), label the actual level of pipe moisture and city gate locations.

Response: On average, based on Bay State's operating experience, moisture levels are at approximately two (2) pounds per million cubic feet of natural gas. Bay State does not maintain records at each of its city gate locations of the "actual" level of the moisture in the natural gas delivered, but relies upon the monitoring conducted by the interstate natural gas pipeline companies for the purposes of federal compliance. See Bay State's response to AG-2-26.

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

RESPONSE OF BAY STATE GAS COMPANY TO THE
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D. T. E. 05-27

Date: June 6, 2005

Responsible: Danny G. Cote, General Manager

AG-2-25 Describe the Company's program to monitor pipe moisture in the pipes and mains that are the subject of the Company's proposed replacement program. State when that program first started, describe all changes to the program and the year the change occurred.

Response: Please see Bay State's response to AG-2-26.

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

RESPONSE OF BAY STATE GAS COMPANY TO THE
SECOND SET OF INFORMATION REQUESTS FROM THE ATTORNEY GENERAL
D. T. E. 05-27

Date: June 6, 2005

Responsible: Danny G. Cote, General Manager

AG-2-26 Describe the Company's strategy to mitigate pipe moisture in the pipes and mains that are the subject of the Company's proposed replacement program. State when that program started, describe all changes to the program and the year the change occurred.

Response: As stated in Bay State's response to AG-2-21, moisture is only able to get into Bay State's natural gas distribution system as a result of moisture present in the natural gas itself as it enters Bay State's distribution system from the interstate pipeline system. In order to combat this, interstate transmission pipelines monitor moisture levels in order to remain below the federally established maximum of seven (7) pounds per million cubic feet of natural gas delivered. The average moisture content as reported to Bay State by the transmission pipelines is approximately two (2) pounds per million cubic feet of natural gas delivered. Based upon Bay State's vast experience in managing and operating distribution systems, it does not believe that moisture content in the natural gas commodity is a material source of pipe degradation.